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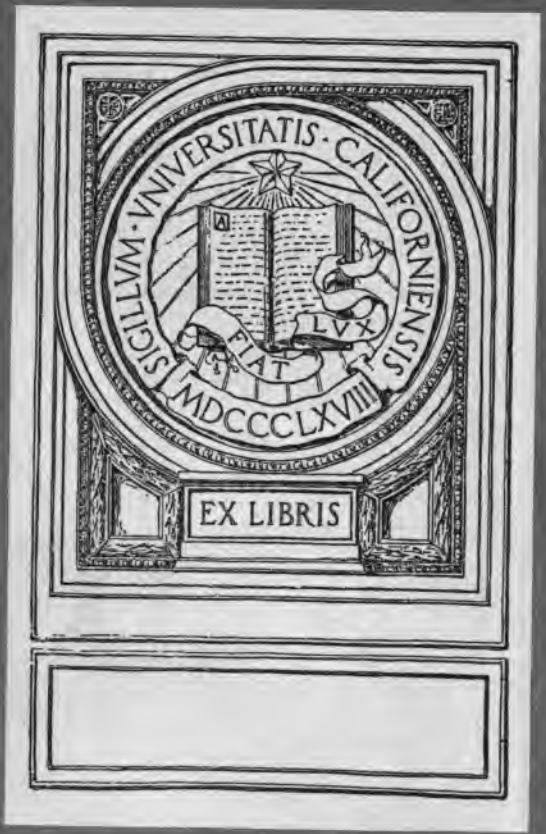
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WHALE HUNTING WITH GUN AND CAMERA

WHALE HUNTING *with* GUN *and* CAMERA

A NATURALIST'S ACCOUNT OF THE MODERN SHORE-WHALING INDUSTRY, OF WHALES AND THEIR HABITS, AND OF HUNTING EXPERIENCES IN VARIOUS PARTS OF THE WORLD

BY

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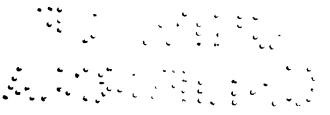

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THIS BOOK IS AFFECTIONATELY INSCRIBED TO

MY WIFE

WITHOUT WHOSE ENCOURAGEMENT IT
WOULD NEVER HAVE BEEN WRITTEN

AND TO

MY MOTHER

WHO HAS BORNE THE ANXIETIES
OF HER SON'S LONG WANDERINGS

355260

PREFACE

In this book I have endeavored to tell of modern shore whaling as I have seen it during the past eight years while collecting and studying cetaceans for the American Museum of Natural History. This work carried me twice around the world, as well as northward on two expeditions to Alaska, and southward to the tropic waters of Borneo and the Dutch East Indies.

I have also tried to give, in a readable way, some of the most interesting facts about whales and their habits, confining myself, however, to those species which form the basis of the shore whaling industry, or are commercially important, and which have come under my personal observation.

In all of this work the camera has necessarily played a large part, for it is only by means of photographs that whales can be seen in future study as they appear alive or when freshly killed. It is hardly necessary to say that the photographing has been intensely interesting, and to any one who is in search of real excitement I can heartily recommend camera hunting for whales.

It should be understood that this book is in no sense a manual of the large Cetacea. I hope, however, at some future time to write a volume which will treat of this wonderful mammalian order in a less casual

way, and thus satisfy a desire which has been ever present in my mind since I began the study of whales.

Some portions of this book have been published as separate articles in the *American Museum Journal, World's Work, Metropolitan, Outing, National Geographic,* and other magazines, but by far the greater part of it is new.

There have been many pleasurable sides to the work, but one of the most delightful has been the friends that I have made, and my cordial reception by the officials of the whaling companies in whatever corner of the world I have chanced to be.

Space will not permit me to mention all those to whom I am indebted and who have contributed to the success of the various expeditions, but I wish first to express my gratitude to the Trustees of the American Museum of Natural History, under whose auspices all my work upon cetaceans has been conducted, and especially to President Henry Fairfield Osborn for his encouragement and wise counsel.

Captains I. N. Hibberd and John Barneson have never failed in kindness and the President and Directors of the Toyo Hogei Kabushiki Kaisha of Osaka, and Mr. D. Ogiwara of Shimonoseki, Japan, are in a large measure responsible for the success of the work conducted in the Orient. Not only did these gentlemen freely extend the courtesies of their ships and stations, but also presented to the American Museum of Natural History skeletons of all the large Japanese cetaceans, which are the only specimens of Asiatic whales in America.

PREFACE

Thanks are due to the Directors of the (former) Pacific Whaling Company of Victoria, B. C., and to the (former) managers of the stations, Mr. Sidney C. Ruck, V. H. Street and J. H. Quinton. Mr. Ruck also furnished me with valuable data as to the progress of the American West Coast whaling industry and assisted in other ways.

I cannot mention, individually, all the gunners who have entertained me ashore and afloat, but the kindness of Captains H. G. Melsom, Fred Olsen and Y. E. Andersen I shall never forget. Captain Melsom has also read portions of the manuscript of this book and in criticism has afforded me the benefit of his long experience and keen observation.

My wife, Yvette Borup Andrews, has transcribed practically all of this book from my dictation and has assisted in numberless other ways throughout its preparation, and to her my thanks are due.

Lastly, I wish to express my gratitude for material assistance throughout the work upon cetaceans to Dr. Frederic A. Lucas, Director of the Museum; Dr. J. A. Allen, Dr. Herman C. Bumpus, Messrs. George H. Sherwood, (late) George S. Bowdoin and Mr. and Mrs. Charles L. Bernheimer.

ROY CHAPMAN ANDREWS,
American Museum of Natural History,
New York City.

February 8, 1916.

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WHALE HUNTING
WITH GUN AND CAMERA

WHALE HUNTING WITH GUN AND CAMERA

INTRODUCTION

THE DEVELOPMENT OF SHORE WHALING

ALTHOUGH the commercial products of whales have contributed largely to the comfort and welfare of the civilized world for over a thousand years, never have the animals been of greater economic importance than they are today

It is true that the magnificent fleet of ships which had its birth in the New England States has passed away, and that the smoke of cotton-mills now drifts over the famous old city of New Bedford where once the harbor was filled with the towering masts of scores of whaling vessels.

But as one chapter of whaling history closed another opened and the scene shifted to Norway, where Tønsberg, a little city in Christiania Bay, has become the Alpha and Omega of the modern whaling alphabet. It was there, in 1864, that Svend Foyn invented the harpoon-gun and brought into existence the sturdy

little steamships which were destined to take the place of New England's fleet, destroyed by the Confederate raiders during the Civil War.

Although despised by the "deep-water" whalers of New Bedford, nevertheless shore whaling has rapidly grown into a world industry which today, in the height of its prosperity, yields a revenue of nearly $70,000,000 a year.

In the old days only three species, the sperm, bowhead and right whale, were hunted and until Svend Foyn invented the harpoon-gun the fin whales, of less commercial value, were seldom captured. Their yield of oil was so small, and the whalebone so short and coarse, that if these products alone were utilized they were not worth the trouble of killing. Moreover, the great speed of the animals in the water and their tendency to sink when dead made them unacceptable to the men who hunted in a small boat with a hand harpoon and lance.

With the development of steam whalers the situation was changed, for they made possible the capture of "finners" in sufficient numbers to warrant the erection of stations at certain points on the shore, near the feeding grounds of the animals, where the huge carcasses could be brought in and converted into commercial products.

The perfection of the harpoon-gun and steam whale ships came only after long discouragement and persistent effort upon the part of Svend Foyn. Foyn was born in Tønsberg in 1809, and died there in 1894. He went to sea at fourteen in the merchant service

and later entered the sealing fleet where he eventually made considerable money. It was while sealing that he conceived the idea of capturing the fin whales with a bomb-harpoon, and 360,000 *kronen* were spent in experimenting before he succeeded in building a suitable gun and vessel.

In 1864 he went to Finmark for the first time in the small ship *Spes et Fides,* but caught nothing and was equally unsuccessful in the two following years. In 1867 he secured the first whales at Vardö, in Varangerfjord, and the next season killed 30. In 1869 he went north with two ships but got only 17 whales, and in 1870 only 36. It was in this year that at Kirkeö the first factory for converting whale flesh into guano, or fertilizer, was built and successfully operated. Foyn's best years were between 1871 and 1880, when 506 whales were killed, having a value of about 2,000,000 kronen.

In 1877 a competitive company began work in Jarfjord, and in 1881 two others started at Vardö and two in West Finmark near the North Cape. In 1882 Norway had 8 companies and 12 ships, and five years later 20 companies and 35 ships. In 1890 the whales began to show the effect of continual persecution, decreasing rapidly in numbers, and five companies shifted their operations to Iceland. In 1896 the 18 ships hunting there killed 792 whales, yielding 49,500 barrels of oil; in the same season 29 ships off the Finmark coast caught 1,212 whales.

From the very beginning the Norwegian fishermen were hostile to the shore whalers, for they believed

that the whales drove the fish toward the land and into their nets and that their industry was being greatly injured by the slaughter of the animals. Although it has been clearly demonstrated that whales have no direct influence upon the movements of fish, nevertheless in 1903 the Störthing prohibited shore whaling altogether.

The efforts of the Norwegian whalers had been watched with interest in other parts of the world and in 1897 shore whaling began in Newfoundland; there it thrived amazingly, and by 1905 eighteen stations were in operation upon the island and in its immediate vicinity.

In 1905 the first shore station on the Pacific coast of America was built at Sechart, in Barclay Sound, on the west side of Vancouver Island. This factory was under the management of the Pacific Whaling Company, of Victoria, B. C., and although their first season was not a success, a revision of the methods of handling the carcasses resulted in a lucrative business being established. In 1907 a second fine station was erected at Kyuquot, one hundred miles north of Sechart.

About this time the Tyee Company was formed under the direction of Captains Hibberd and Barneson, and a station was constructed at Murderer's Cove, on the southern end of Admiralty Island, Alaska. The hunting here was entirely conducted in the inland waters of Frederick Sound, and after a few seasons the whales became so reduced in numbers that operations had to be transferred to the open sea about

Cape Ommaney, sixty miles away; the Tyee Company was later re-formed as the United States Whaling Company.

In 1910 the Pacific Whaling Company was sold to the Canadian North Pacific Fisheries, Ltd., with stations at Rose and Naden Harbor, Queen Charlotte Islands, and Bay City, Washington, besides the two Vancouver factories. Another establishment, known as the Alaska Whaling Company, started work at Unimak Pass, Aleutian Islands, Alaska, and a Norwegian firm built a station on the Pacific coast of Mexico.

About the time Newfoundland became interested in shore whaling, the Russians and Japanese started operations along the coasts of Siberia and Japan, respectively. The Russian industry there was abruptly ended at the time of the Russian-Japanese war and has not since been resumed, but the Japanese have continued their work with great success and today vie with the Norwegians in the development of shore whaling, for by their methods almost every particle of a whale's carcass is utilized for human consumption.

The Toyo Hogei Kabushiki Kaisha, of Osaka, is the largest whaling company in the world, owning fifteen stations and twice as many ships, and conducting operations in almost every part of the Japanese Empire.

The South African industry was founded by Mr. John Bryde, of Sandefjord, Norway, who in 1909 erected the first station in Durban and another in the

following year in Saldanha Bay on the west coast. Stations have also been built at several places in Australia and Tasmania, and in New Zealand humpback whales are being caught in wire nets. This method is so unique that a description of it here may be of interest.

The station is owned by the Messrs. Cook Brothers and is located south of the Bay of Islands, at the village of Wangamumu. On their annual migrations the humpback whales often pass through a narrow channel just under Cape Brett, which separates a cluster of outlying rocks from the mainland, and makes an ideal spot to place the nets. Having a stretch of five hundred or six hundred feet and a depth of two hundred, the nets, meshed to seven feet and made of three-eighths-inch wire rope, are hung on strong cables buoyed by huge floats and drogues. When a whale is sighted from the coast, steam launches place the three nets, which are allowed to float loose, the principle being to so hamper the whale by the entangling wires that it falls an easy prey to the hunters. What happens when a whale is caught can best be told in the words of an eye-witness.

When the nets are in position the launches and attendant whale-boats, with their crews, take up their stations at some distance to watch for the upheaval and dancing float-line that marks the "striking" of a whale. . . . Suddenly a sort of shudder runs through the sea. There are tossing billows and wild commotions away by the bobbing float-lines. "Hurrah! She's struck!" is the cry.

Away go the boats, each racing to be first "fast" to the

struggling "fish" and so earn the bonus that rewards the winning crew.

A mighty gray-black head, entangled in a clinging web of wire, rears from out the water. Up, up, it goes till a huge bulk of body towers a good fifty feet in the air, its side fins thrashing wildly in a smother of foam. It curves in an arch and then, like an arrow, down go whale and net together for the "sound."

Not for long, though. The upward drag of the bunched net-floats, and its necessity for breath, bring the "fish" quickly to the surface—a spouting, snorting, wallowing mass; mad with rage, wild with terror of the unknown, clinging horror that envelopes it.

Bang! bang! go the guns from each boat, in quick succession. Both irons are home and well placed. A wild quiver of flukes and fins, and the whale either "sounds" again or "races" along the surface, towing the boats after it at express speed. But the net holds fast, and at each new effort for freedom the victim becomes more hopelessly "wound up" than before.

Soon, exhausted with futile struggling, the whale comes to rest, and there is a momentary cessation of the mad fight as the leviathan pauses for breath. Huge, panting air-gasps are plainly audible aboard our launch at a distance of half a mile.

The crews are quick to seize the opportunity. With the lance-men ready in the bow, the boats sweep in, one on either side. "Steady with the lance." "Now!" Eight-foot steel blades drive deep for the heart behind the pectoral fins.

A shiver, a hissing spout of water and blood, a wallow and roll of the huge, wire-tangled carcass, flashes of red and white foam in the sunlight, and the black heave of a twenty-foot fin that for one dread instant, scimitar-shaped, a falling wall of bone and sinew, hangs over the boat and its occupants. The boat's crew back out like lightning, just in time. Down crashes the mighty flail, missing its blow

by a bare foot. There is a roar and clap of many thunders, and jetting spurts of spray leap high into the blue.

The boats, backed clear, still hang to the lines, the crews watching events and waiting the end. It may be that the dying whale will "sound" again, or "race" in a final effort.

But, no. The lances have gone home. A few more wallows of despair, the great tail-flukes thrash the water with lessening force, and presently the huge body, inert, lifeless, lies quietly on the surface. Hawsers are made fast to the dead whale, and while the boats return to their stations to watch the remaining nets it is towed by the launch to the flensing jetty ashore.[1]

Since the beginning of the last century the sub-antarctic islands known as the Shetlands, South Orkneys, Falklands, South Georgia and Kerguelen have proved to be the greatest whaling grounds of modern times, and are today yielding nearly $35,000,000 per year—just one-half of the total world revenue derived from the shore whaling industry. On South Georgia alone, eight companies with headquarters in Norway, England, Scotland, and Argentina are in operation, and all the other islands have one or more stations or "floating factories."

In South America there are several stations on the coast of Brazil, Argentina, and Chile, and operations are also being carried on at Spitzbergen, the Faroe Islands, Shetland, the Hebrides, Greenland, and the Galapagos Islands. Shore whaling is, therefore, a world industry in the truest sense of the word.

When it was discovered that in certain localities the whales were being rapidly killed off and the vessels

[1] D. W. O. Fagan in the *Wide World Magazine*, pp. 423-432.

A modern shore whaling station at Kyuquot, Vancouver Island, B. C. The flensing slip, carcass platform and wharf are shown in the foreground. In the background is the manager's dwelling.

had to hunt so far from the stations as to make the trip unprofitable, the "floating factory" was devised. This is a large steamship of five or six thousand tons which is fitted with huge boiling vats and can be moved about from place to place as the whales themselves travel. Usually two or three steamers operate from one floating factory for formerly when only the blubber was used and the carcass was turned adrift, one ship could not supply enough whales to make the work profitable. These factories are used most extensively on the South Atlantic grounds.

The modern shore station is usually situated in a

The *Orion* with three humpback whales at Sechart, Vancouver Island.

bay or cove not far from the open sea. The flensing slip and carcass platforms are the most striking portions of the establishment, and these are surrounded by boiling vats, the machine for drying the flesh, the engine house, wharf, bunk houses, offices, and the dwelling of the manager, the whole forming an imposing group of buildings.

Many of the whaling stations have very comfortable quarters and those on the bleak islands of the South Atlantic are even luxurious. The manager's house is often beautifully furnished, with electric light, bathrooms, and even steam heat, so that when one becomes accustomed to the all-pervading odor from the "dryer," the station is a delightful place at which to work. Although each one differs in respect to food, nevertheless the meals are for the most part excellent, for the managers realize that if their men are to be contented they must be well fed.

The whaling ships usually return to the station each night and, if one is free from seasickness, furnish a rather inviting home for a short stay. They are trim, high-bowed vessels of about one hundred tons burden, ninety to one hundred feet long, and have a speed of from nine to twelve knots per hour. Round-bottomed to facilitate speedy manipulation, they ride the water like a cork but roll and pitch almost beyond belief in the slightest seaway.

Most striking of all the upper works is the harpoon-gun mounted upon a heavy iron support at the very bow. It is a short cannon, 51½ inches long, with a

3-inch bore, and turns easily upon a swivel up and down and from side to side.

At the butt end, under a short wooden handle, is an iron lever, the trigger, which when pressed upward explodes the gun. The charge is 300 to 375 drams of very coarse, black powder which is sewed up in a cheesecloth sack and rammed home from the muzzle; then come wads of okum, hard rubber or cork, and wool, after which the harpoon, well greased, is pushed in and hammered solidly into place with a wooden mallet. Some guns require more powder than others but if too much is used the iron will be bent as it leaves the muzzle.

The harpoon is 76 inches in length, and has a double shaft, at the end of which are 4 twelve-inch flukes, or barbs; these are tied to the shaft but spread widely upon entering the whale's body and prevent the iron from drawing out. The harpoon is tipped with a hollow point, called the "bomb," which is filled with powder and ignited by a time fuse set for the desired interval. Three or four seconds after the gun is fired the bomb bursts, frequently killing the whale almost instantly.

The harpoon is made of the best Swedish iron and weighs one hundred and ten pounds. After it has been fired into the body of a whale it is usually badly bent and twisted, but the tough, elastic iron can be straightened by the station blacksmith and made as good as new.

A large ring slides easily along the double shaft of the harpoon, and to this one end of a five-inch rope

The harpoon gun on the *Rex Maru*. The gun is loaded and the harpoon is shown projecting from the muzzle; coiled on the iron pan below is the rope which is carried with the iron in its flight. The winch may be seen in front of the bridge at the left of the picture.

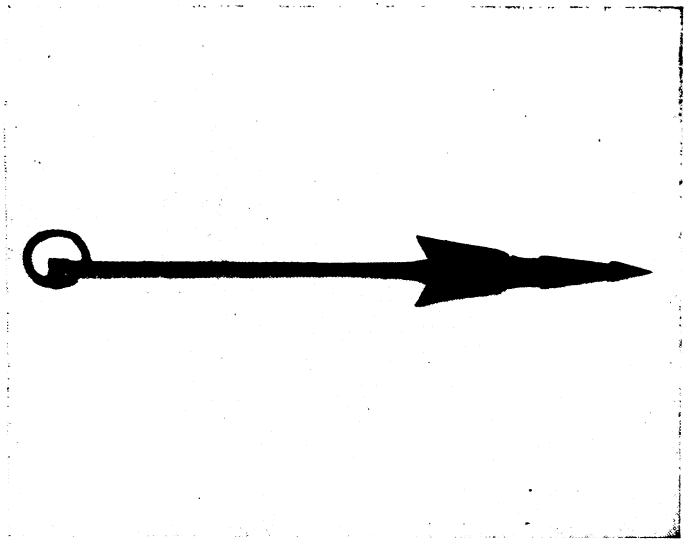
is fastened. Forty or fifty fathoms of a somewhat smaller line, called the "forerunner," are coiled on a heavy iron pan just under the gun, giving slack to be carried with the harpoon as it flies through the air.

From the pan the rope passes backward over a roller in the bow of the ship to a double winch just in front of the bridge and down into the hold, where a thousand fathoms (6,000 feet), or more, are carried. By means of the winch the whale is "played" as one would use a reel on a fishing rod, and after the animal has been killed it is hauled to the surface and fastened to the side of the ship.

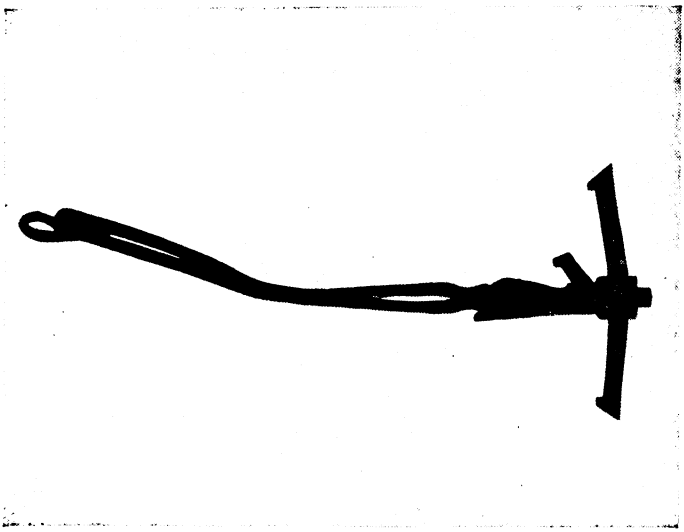
The harpoon lines are made of the finest Italian hemp and tested for a breaking point of eighteen tons, but the forerunner is tested for only fifteen or sixteen tons. Some, made especially for use in hunting the giant blue whale, will resist a strain of twenty-eight tons. If a tight line is kept and there are no sudden jerks the ropes seldom break.

Not far beyond the winch the mast is stepped, bearing near its peak a small barrel, called the "crow's nest," from which the whales are sighted.

The vessels carry a crew of ten or twelve men beside the captain, who is usually also the gunner. In Japan vessels are required by the coasting laws to have a Japanese in command, and consequently a native captain is employed who takes the ship in and out of the harbor. He is really the pilot, and the vessel is turned over to the Norwegian gunner as soon as the open sea is reached.



The harpoon is tipped with a hollow point called the "bomb," which is filled with powder and ignited by a time fuse. The barbs, or flukes, are tied to the shaft of the iron.



The harpoon after it has been fired into the body of a whale. The bomb has exploded and the shaft is bent.

Although in various parts of the world I have met two or three gunners who were not Norwegians, there are not many such. From their Viking ancestors the Scandinavians have inherited their love for the sea and, since Svend Foyn's time, Tønsberg has sent forth

A trial shot with the harpoon-gun. The harpoon line is shown, and three men may be seen in the barrel at the mast head.

her sons to the whaleships much as did New Bedford half a century ago. Thus the present generation has grown up as the industry developed, and from boys to men they have seen it in all its phases and learned not only how to shoot a whale but how to handle it afterward, which is fully as important.

Even as the harpoon-gun brought with it a new

era of whaling, so it gave to the scientist undreamed-of opportunities for the study of cetaceans. Until shore stations were established, few indeed were the naturalists who had examined more than five or six whales during their entire lives. These carcasses were usually of whales which had met with some accident at sea and had been cast up on the beach; almost always the animals had been dead for days before they came under the notice of a competent scientific observer, and had lost much of their original proportions and color. A whale's body begins to generate gases at an astounding rate as soon as the animal is dead, and within a very few hours becomes so swelled and distorted that the true proportions are almost lost. Even trained naturalists did not always take this fact into consideration, and their descriptions and figures were consequently notable chiefly for their inaccuracy.

It is only within a very few years that it has been generally recognized how rapidly cetaceans change color when dead, and often in scientific papers whales are described as "black" which are never black in life. By far the greater number of whales and dolphins have various shades of slate, or gray, on the upper parts, and if exposed to the sun for a few hours these portions turn jet black.

Again, there is in all cetaceans great variation among individuals of the same species, and whales from the same school or "pod" may differ widely in proportions and general color. Some may be long and slender, others short and thick; one may have

a light gray back and pure white underparts, while a second, taken from the same herd, is dark slate above and strongly shaded below; and, moreover, the skeletons often vary almost as greatly as the external characters.

Quite naturally when these extremes came under

A near view as the gun is fired at a target. The harpoon rope is visible through the smoke.

the notice of a scientist who had, perhaps, seen but three or four whales in his entire life, they were at once judged to be representative of different species and were given new names. This course cannot be wholly condemned, for under existing conditions it was almost the only one to be followed. Although it did put on record many valuable facts concerning

the history of the animals, it also resulted in multiplying nominal species to such an extent that the work of later investigators in separating the valid from the invalid has become a herculean task; quite false conclusions as to the distribution of the various whales were also drawn, which only a vast amount of labor and study can rectify.

The number of whales taken during a season varies greatly with the locality, but at one of the Vancouver Island stations when I was there in 1908, three hundred and twenty-five were killed in seven months by one ship. In a single week twenty-six whales were captured, and on June 10, the *S. S. St. Lawrence,* Captain Larsen, brought in four humpbacks, one blue whale, and one finback.

Whales are such enormous creatures that the ordinary methods used in the study of other animals cannot be applied to them. Instead of having actual specimens before one for comparison, a naturalist must depend almost entirely upon photographs, notes, measurements, and descriptions.

Until shore whaling began such data were rare and most unsatisfactory. When a whale is cut in as it lies along the side of a ship, it is never possible to see the entire animal at once; it is almost impossible to secure photographs of real value for comparative work, and even measurements can be taken only with difficulty and not without a large percentage of error. Internal anatomical investigations are out of the question, because as soon as the blubber has been stripped off the carcass is turned adrift.

By the establishment of shore stations these difficulties have been largely eliminated. The whales are usually drawn entirely out of the water upon the slip where, before the blubber is stripped off, they can be measured, photographed, and described. As they are being cut in it is possible to make a fairly detailed study of the fresh skeleton and other parts of the anatomy—if the investigator is not afraid of blood and grease. Moreover the great number of whales of a single species brought to the stations allows a study of individual variation, which evidently is greater among some of the large cetaceans than in other groups of mammals.

Since shore stations are located in widely separated parts of the world, they have facilitated investigations of the distribution, life history, and relationships of large whales, which otherwise would have been impossible. Thus it is obvious that a naturalist who is fortunate enough to stay for some time at a modern factory has opportunities for original work such as were undreamed of before the days of steam whaling.

The directors of the companies, and the managers of the stations, have usually been glad to assist in the study of the animals which form the basis of their industry, and have generously extended the courtesies of their ships and stations. In some instances they have gone to considerable trouble to secure specimens which could be prepared and presented to museums in various parts of the world for exhibition and osteological study. It is deeply to be regretted

that the wholesale slaughter of whales will inevitably result in their early commercial extinction, but meanwhile science is profiting by the golden opportunities given for the study of these strange and interesting animals. Thus, the old saying that "it is an ill wind that blows good to no one" applies very decidedly to the whaling industry.

CHAPTER I

MY FIRST WHALE HUNT

GREAT lumbering swells of gray water rolling out of the fog from the wide sweep of the open Pacific were the picture I saw through the round, brass-bound frame of the porthole on the *S. S. Tees.* It was the last of May, but the cold of winter still hung in the sea air, and even when we drew in toward the foot of the mountains which poked their fir-clad summits far up into the mist clouds, I shivered in my heavy coat and tramped about on deck to keep warm. Finally when we were right under the towering mountain's walls, we swung abruptly into smooth water, the long roll and pitch of the ship slackened and died, and we were quietly plowing our way up river-like Barclay Sound, which, from the west coast, cuts into the very heart of Vancouver Island.

It was hardly six o'clock in the morning when the wail of the ship's siren whistle shot into the deep mountain valley where the station of the (former) Pacific Whaling Company is located at the one-time Indian village of Sechart. With a great deal of curiosity I strained my eyes through the fog to study the group of white frame buildings which straggled up from the water's edge back into the valley.

I could see only one or two Indians, clad in dirty shirts and overalls, loafing about placidly staring at the ship, but by the time she had been warped in and the winch had started to swing aboard the great oil casks which lined the wharf, two pleasant-faced men appeared, one of whom I learned was Mr. Quinton,

Captain Balcom at the gun on the *Orion*.

the station manager; to him my letters were presented. With him was Mr. Rolls, the secretary of the station, who showed me to a room at the house. I got out of my "store clothes" and came down to the wharf, now lined with men of six nationalities—for Norwegians, Americans, Newfoundlanders, Indians, Chinese, and Japanese are employed at these west coast stations.

Tied up to the side of the pier was the ship *Orion*. She was typical of all steam whalers, had been built in Norway and made, under her own steam, the long stormy passage across the Atlantic to Newfoundland. A few years of work there and she started for the Pacific around the Horn, beating her way northward to the scene of her present work at Sechart.

The *Orion* had not gone to sea that morning, for the fog outside made it useless to hunt; even if the ship could have kept her bearings in the mist it would have been impossible to see the spout of a whale, or to follow the animal if one were found.

The crew were all ashore, and I met Captain Balcom, an alert young Canadian, and one of the few successful gunners who was not a Norwegian. He offered at once to take me "outside" with him when the weather cleared but said we would see only humpbacks, for the blue whales and finbacks had not yet appeared on these hunting grounds. At Kyuquot, a station only one hundred miles farther up the coast, blue whales and finbacks were taken with the humpbacks in March as soon as the station opened, while at Sechart they did not come until July.

When the station was first located at Sechart, humpbacks were frequently taken in Barclay Sound but were soon all killed, and others did not take their places. At the time I was there, the *Orion* seldom found whales less than thirty miles at sea. She usually arrived about two o'clock in the morning, dropped her catch, and in half or three-quarters of an hour

was again on the way out in order to reach the feeding grounds shortly after daylight.

I went aboard with Captain Balcom at ten o'clock and turned in on the Mate's bunk. The cabin was small, but not uncomfortable, and it was not long before I was asleep. I did not even hear the ropes being cast off in the morning and only waked when the boy came down to call the Captain. We were well down the Sound when I came on deck, and were steaming swiftly along among little wooded islets half shrouded in gray fog. Far ahead the ugly, foam-flecked rocks of Cape Beale stretched out in a dangerous line guarding the entrance to the Straits of Juan de Fuca; beyond was a sheer wall of mist shutting us out from the open sea.

The Captain was sure it was only a land fog hanging along the coastline, and that we would soon run through it into clear air. As the ship rose to the long swells of gray water and burrowed her way straight ahead deeper and deeper into the mist, everyone on deck was drenched and shivering. Fifteen minutes of steaming at full speed and the gray curtain began to thin; soon we ran out of it altogether.

There was not a big sea running, but the little *Orion* was dancing about like a cork. Balcom said, "It is calm weather so long as she keeps her decks dry," and with this rather dubious comfort I settled down to get used to the tossing as best I could.

Everything was intensely interesting to me, for it was my first trip on a steam whaler. Already a man had been sent aloft and was unconcernedly swinging

about with glasses at his eyes watching the water ahead. I learned later, when seasickness was a thing of the past, what a wonderful view can be had from the crow's nest. The whole level sea is laid out below like a relief map and every floating object, even

Loading the harpoon-gun. "The charge is 300 to 375 drams of very coarse, black powder which is . . . rammed home from the muzzle; then come wads of okum, hard rubber or cork, after which the harpoon . . . is hammered solidly into place."

the smallest birds, shows with startling distinctness. And if it is comparatively smooth, one can look far down into the water and see a whale or shark long before it is visible at the surface or to those on deck.

Before we left the station, the harpoon-gun had not been loaded. The muzzle was plugged with a wooden block and the iron rope-pan drawn upward

and tied against the gun's support. When coming in from the last trip the vessel had encountered heavy weather, and the rope was taken off the pan to prevent it from being carried away by a wave and fouling the propeller. Now as we were nearing the feeding grounds, the Bo's'n went forward to load the gun, re-coil the harpoon line, and see that all was clear and running smoothly.

The men on board were greatly interested in my camera and anxious that opportunities might be given for pictures. For two hours, with the Chief Engineer and the Mate, I sat aft on the great coil of towing line, used only in very heavy weather, listening to stories of the idiosyncrasies of whales, especially humpbacks. Their firm conviction was that one never could guess what a "hump" was going to do—except that it would be exactly what was least expected.

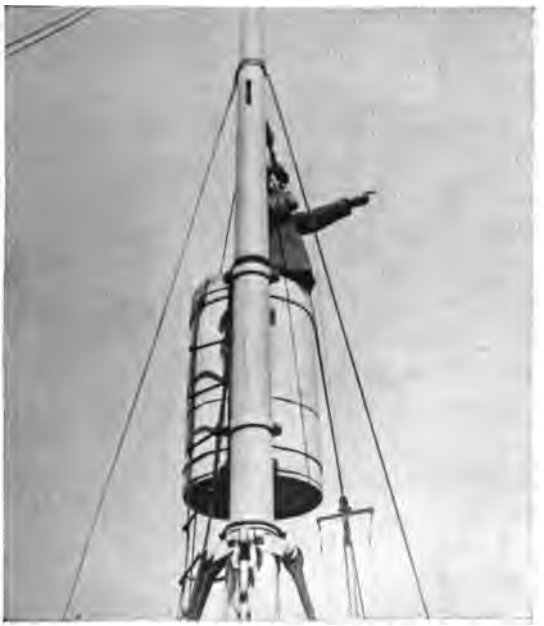
The Engineer had just finished telling about a big fellow that a few days before had come up in front of the ship and swam towards it with his enormous mouth wide open, when the man in the barrel called down, "Whales on the port bow!"

I jumped as though a bomb had been exploded and grabbed my camera. The other men took things rather quietly, for the whales were still a long way off. The Captain tried to show me the spouts but it was several minutes before I could distinguish the white columns of vapor shooting up every few seconds.

There were three of them—all humpbacks. On the

Model of a humpback whale in the American Museum of Natural History. The model was prepared by Mr. James L. Clark, under the direction of Dr. F. A. Lucas.

instant, the dark bodies slowly rounded into view and three huge, propeller-like tails were smoothly lifted out of the water, elevated vertically to the surface, and again drawn below. It is impossible to describe



"The man in the barrel called down, 'Whales on the port bow!'"

the ease and beauty of the dive. To look at the heavy body and long, ungainly flippers of a humpback one would hardly suspect that there could be grace in any movement, and yet the enormous animals slide under the surface as smoothly as a water bird.

When the flukes came out, the Captain rang for

half-speed, for the whales would probably be down several minutes. Turning the wheel over to the Mate, he went forward to the gun, pushed up the spring which cocked it, and waited, alert, for the animals to rise.

I had descended with him from the bridge and stood just behind the gun platform. The ship, her engines stopped, was rolling about on the mirror-like patches of water left by the whales as they went down. After ten minutes of waiting three silvery clouds suddenly shot upward a quarter of a mile away. Instantly the engine signal rang and the ship swung about, plowing through the water at full speed until the whales sounded. For two hours this kept on. Each time when we were almost within range the big fellows would raise themselves a little higher, arch their backs, and turn downward in a beautiful dive, waving their huge flukes as though in derision.

I had my notebook and pencil at work as well as the camera but it was getting pretty difficult to use either. The wind had risen and I was deathly sea-sick; even the best sailors lose their "sea legs" when aboard one of these little eggshell boats after a long period ashore, and mine were gone completely. The *Orion* was twisting and writhing about as though possessed of a demon, and every time she climbed a huge wave to rock uncertainly a moment on the crest and then plunge headlong down its smooth, green slope, I was certain she would never rise again. Balcom was doggedly hanging to the gun, but just after we had both been soaked by a big sea that came over

the ship's nose he shouted, "If we don't get a shot soon we'll have to leave them."

At that time we were heading for the whales, which were spouting only a short distance away. One of them had left the others and seemed to be feeding. He was swimming at the surface, sometimes under for a second or two, but never far down. The ship slid nearer and nearer with engines at dead slow until the huge body disappeared not thirty fathoms away.

"In a minute he'll come again," shouted Balcom, feet braced and bending low over the gun.

I was clinging to a rope just behind him, trying to focus the camera, but the flying spray made it well-nigh impossible. Suddenly I saw the Captain's muscles tighten, the tip of the harpoon drop an inch or two, and caught a glimpse of a phantom shape rushing upward.

Almost on the instant a blinding cloud of vapor shot into our very faces, followed by the deafening roar of the gun. I saw the black flukes whirl upward and fall in one tremendous, smashing blow upon the water; then the giant figure quivered an instant, straightened out, and slowly sank. For a moment not a sound was heard on the vessel save the steady "flop, flop, flop" of the line on the deck as the dead weight of forty tons dragged it from the winch.

Balcom leaned over the side and saw the rope hanging rigidly from the ship's bow. "I must have caught him in the heart," he said, "and killed him instantly."

As the Captain straightened up he shouted to the

Engineer to check the line. Then began the work of bringing to the surface and inflating the dead whale. Taking a hitch about a short iron post, the harpoon rope was slacked and run through a spring pulley-block on the mast, just below the barrel, to relieve

"Two men with long-handled knives began to cut off the lobes of the tail."

the strain of raising the great body. As the winch ground in fathom after fathom of line the vessel heeled far over under the tremendous weight. I was clinging to the ship's side looking down into the water and soon saw the shadowy outline of the whale, fins wide spread, nearing the surface. As it came along-

side a lead-weighted line was thrown over the tail, a rope pulled after it, then a small chain, and finally the heavy chain by which the carcass was made fast to the bow.

The winch had not yet stopped when two men with long-handled knives began to cut off the lobes of the tail to prevent the flukes from pounding the rail as the body swung up and down in the seaway. Already other sailors were working at a long coil of small rubber hose, one end of which was attached to an air pump and the other to a hollow, spear-pointed tube of steel, perforated along its entire length. This was jabbed well down into the whale's abdomen, the engines started, and the animal slowly filled with air. When the body had been inflated sufficiently to keep it afloat, the tube was withdrawn and the incision plugged with oakum.

The other whales were a long way off when the ship was ready to start. The man in the "top" reported them as far to the south and traveling fast. As there was little chance of getting another shot that day and the wind was blowing half a gale, the Captain decided to turn about and run for the station.

We reached Sechart at 1:30 A. M. and the whale was left floating in the water, tied to the end of the wharf near a long inclined platform called the "slip"; then the *Orion* put out to sea and I went to bed at the station. I shall never forget my intense surprise next morning when I saw the humpback "cut in." Work began at seven o'clock, and as the Manager had just

awakened me, I ran out and did not wait for breakfast, thinking there would be ample time to eat when the operations were under way. It soon became evident, however, that there were no breathing spells when whales were being cut in, and every soul was

"A hollow, spear-pointed tube of steel . . . was jabbed well down into the whale's abdomen, the engines started, and the animal slowly filled with air."

at his work until the last scrap of flesh was in the boiling vats.

After a heavy wire cable had been made fast about the posterior part of the whale, just in front of the flukes, the winch was started. The cable straightened out, tightened, and became as rigid as a bar of steel. Slowly foot after foot of the wire was wound in and

the enormous carcass, weighing at least forty tons, was drawn out of the water upon the slip.

One of the Japanese scrambled up the whale's side and, balancing himself on the smooth surface by the aid of his long knife, made his way forward to sever at the "elbow" the great side fin, or flipper, fifteen feet in length.

Before the carcass was half out of the water other cutters were making longitudinal incisions through the blubber along the breast, side, and back, from the head the entire length of the body to the flukes. The cable was made fast to the blubber at the chin, the winch started, and the thick layer of fat stripped off exactly as one would peel an orange. When the upper side had been denuded of its blubber covering, the whale was turned over by means of the canting winch, and the other surface was flensed in the same manner.

It was a busy and interesting scene. The strange, unfamiliar cries of the Orientals mingled with the shouts of the cutters and the jarring rattle of the winch as the huge strips of fat were torn from the whale's body, fed into the slicing machine, carried upward, and dumped into enormous vats to be boiled or "tried out" for the oil.

When the blubber was entirely gone, the carcass was split open by chopping through the ribs of the upper side and cutting into the abdomen, letting a ton or more of blood pour out and spread in a crimson flood over the slip. A hook was attached to the tongue bones (hyoids) and the heart, lungs, liver, and intestines were drawn out in a single mass.

The body was then hauled to the "carcass platform" at right angles to, and somewhat above, the "flensing slip," the flesh was torn from the bones in two or three great masses by the aid of the winch, and the skeleton disarticulated.

Flensing a whale at one of the Vancouver Island stations. A great strip of blubber is being torn from the animal's side.

After the bones had been split and the flesh cut into chunks two or three feet square, they were boiled separately in great open vats which bordered the carcass platform on both sides. When the oil had been extracted, the bones were crushed by machinery making bone meal to be used as fertilizer, and the flesh, artificially dried and sifted, was converted into a

very fine guano. Even the blood, of which there were several tons, was carefully drained from the slip into a large tank, and boiled and dried for fertilizer. Finally, the water in which the blubber had been tried out was converted into glue.

The baleen, or whalebone, which alone remained to be disposed of, was thrown aside to be cleaned and dried as opportunity offered. The baleen of all the fin whales is short, stiff, and coarse and in Europe and America has but little value. In Japan, however, it is made into many useful and beautiful things.

I learned that the cutting operations at Sechart and the other west coast stations were conducted in the Norwegian way which is followed in almost all parts of the world except Japan. In the Island Empire a new method has been adopted, which, while it has the advantage of being very rapid, is correspondingly dangerous and will not, I think, ever be widely used.

CHAPTER II

HOW A HUMPBACK DIVES AND SPOUTS

ALTHOUGH it had been possible to secure but few good pictures during my first trip at sea on the *Orion,* nevertheless I had learned much about the ways of humpbacks. One impression, which I subsequently found to be correct, was that this would prove to be the most interesting of all large whales to study—at least from the standpoint of its habits.

There are no dull moments when one is hunting a humpback, for it is never possible to foretell what the animal's next move will be. He may dash along the surface with his enormous mouth wide open, stand upon his head and "lobtail," throwing up clouds of spray with smashing blows of his flukes, or launch his forty-ton body into the air as though shot from a submarine catapult.

He may do dozens of other highly original things, all of which show his playful, good-natured disposition and, if he is allowed to continue his elephantine gambols unmolested, he is as harmless as a puppy. But once imbed an iron in his sensitive flesh and it is wise to keep well beyond the range of his long flippers and powerful flukes which strike the water in every direction with deadly, crushing blows.

The humpback is the whale which is most usually

seen from the Atlantic passenger vessels, and may easily be recognized because when "sounding," or going under for a deep dive, the flukes are almost invariably drawn out of the water; the finback and blue whales, the two other common species, seldom show the flukes.

A humpback whale "sounding." "The humpback comes up obliquely, and, as soon as the spout has been delivered, arches the back and begins to revolve."

When a humpback dives the easy grace with which the animal manipulates its huge, ungainly body and great propeller-like tail, drawing it out of the water smoothly but with irresistible force, always gives me a thrill of admiration. I remember one day, while crossing the Atlantic on the *Kronprinz Wilhelm,* a humpback came up not far from the ship and swam parallel with her for several minutes. Each time the big fellow drew himself up, slowly rolled over, and brought his flukes out, an involuntary cheer went up

A humpback whale with a very white breast. The side fins, or flippers, are almost one-quarter the entire length of the animal, and to them barnacles attach themselves as well as to the folds of the throat and breast.

from the passengers. But it is only when sounding that the tail is shown and never when the whale is feeding or swimming near the surface.

The humpback comes up obliquely and, as soon as the spout has been delivered, arches the back and begins to revolve, finally drawing out the flukes and going down vertically. When hunting, the proper time to shoot is when the dorsal fin begins to show above the water—depending, of course, upon the distance. The iron then has a fair chance to reach the lungs or heart and a larger target is presented.

How far a whale can descend is a matter of conjecture and more or less dispute among naturalists. One writer argues that whales cannot go deeper than three hundred feet because of the tremendous water pressure. But all cetaceans have certain specializations in body structure which undoubtedly enable them to withstand high pressure.

I have, as personal evidence upon this subject, the fact that a blue whale, harpooned between the shoulders and but slightly injured, dove straight downward and took out over a quarter of a mile of rope. We were, at the time, almost a hundred miles at sea and so far as could be determined the animal had gone down to the full limit of the line which hung from the bows as rigid as a bar of steel. The whale remained below for thirty-two minutes and reappeared not more than a hundred yards away and directly in front of the ship.

It is the opinion of every whaler with whom I have talked that all the large cetaceans can descend to a

considerable depth, and each man will give numerous instances, similar to the one I have cited in the case of the blue whale, to prove his point. Until further information is available this subject must be an open one. A smooth, circular patch of water is always left at the spot where a large whale dives. This is undoubtedly produced by suction and interrupted wave action but has given rise to many ingenious and absurd theories in explanation.

When studying whales the most important fact to remember is that *they are one-time land mammals which have taken up a life in the water* and that their bodily activities, although somewhat modified, are nevertheless essentially the same as those of a horse, cow, or any other land mammal.

Since a whale breathes air, when it is below the surface the breath must be held, for if water should be taken into the lungs the animal would drown. Thus, as soon as a cetacean comes to the surface its breath is expelled and a fresh supply inhaled before it again goes down, just as in the case of a man when diving. However a whale is able to hold its breath for a much longer time than can an ordinary land mammal—even as much as forty-five minutes or an hour.

When the animal comes to the surface the breath which has been contained in the lungs under pressure is highly heated, and as it is forcibly expelled into the colder outer air it condenses, forming a column of steam or vapor. A similar effect may be produced by any person if, on a frosty morning, the

breath is suddenly blown out of the mouth. I have often seen a whale blow when its head was still a short distance under the surface and at such times a little water will be thrown upward with the spout.

That whales spout out of the blowholes water which

The tail of the humpback as the animal "sounds" looks like a great butterfly which has alighted upon the water.

has been taken in through the mouth is probably more widely believed than any other popular misconception. As a matter of fact such a performance would be impossible because a whale's nostrils do not open into the back of the mouth as do those of a man, and the animal is not able to breathe through its mouth as do ordinary land mammals.

Instead, an elongation of the arytenoid cartilages

and the epiglottis fits into the soft palate, thereby forming a continuous passage between the nostrils and the trachea, or windpipe, and entirely shutting off the nasal passages from the mouth. In this way a whale can swim with its mouth open, when feeding, without danger of being strangled by getting water into the breathing organs.

The blowholes, or nostrils, have been pushed backward and upward to open on the top of the head instead of at the end of the snout. This is an adaptation to aquatic life, which is also seen in other water mammals, for in this way the nostrils are almost the first part of the body to appear at the surface and the whale can begin to breathe immediately upon rising.

Although all the fin whales have two nostrils, the spout ascends in a single column, which, in the humpback, is from twelve to fifteen feet high. The cloud of vapor is narrow at the base but spreads out at once, forming a low bushy column which rapidly drifts away.

The height and density of the spout in all whales depends upon the animal's size and the length of time it has been below. If the whale has been submerged but a brief period, as during surface dives, a comparatively small quantity of air is expelled and the breath has not had time to become highly heated; consequently the column will be low and thin.

The first spout after sounding is usually the highest and fullest. I have seen humpbacks, which had been badly wounded, lying at the surface close to

the ship, blowing every few seconds, and the spout could hardly be seen although the opening and closing of the blowholes and the metallic whistling of the escaping breath were plainly distinguishable.

Immediately after the delivery of the spout the lungs are refilled, the blowholes being opened widely and protruded upward, and the breath rapidly drawn in. The elevation of the blowholes is probably to prevent a wave from slopping over and filling the nasal passages, but when a whale lies dead upon the slip there is no indication that the nostrils can be protruded. This was first learned through a photograph of a spouting blue whale, taken by Dr. Glover M. Allen in Newfoundland waters, and since then I have secured two others which show it admirably. At the time my first picture was taken we had an interesting experience which I shall never forget.

CHAPTER III

AN EXCITING EXPERIENCE IN ALASKA

AFTER leaving Vancouver Island I had gone north to Murderer's Cove, Tyee, Alaska, and was being most hospitably entertained on board Captain Charles Grahame's ship, the *Tyee*. We were hunting in the waters of Frederick Sound and had been out two days. A big finback had given us an exciting time of it in the afternoon and evening of the second day and I had gone to bed tired out.

Next morning at five o'clock I was awakened by a hand on my shoulder and the voice of the Mate saying:

"We're in a bunch of humpbacks, sir. You'd better get up if you want some pictures."

As I had only removed my coat and shoes the night before, in five minutes I was on deck with my camera and plate holders. It was a gray day, heavy clouds lining the sky and a strong wind blowing from the westward. Already the little steamer was pitching and rolling in a way which made me hate even the thought of breakfast, but catching sight of the flukes of a big humpback just disappearing below the surface on the starboard side, I forgot for a moment that there was such a thing as seasickness. I climbed to the bridge beside the Mate who was at the wheel

and after getting the camera ready for instant use, took out my notebook and glasses.

The whales were all about us but feed was evidently scarce and far below the surface, for the animals were swimming long distances under water, only rising to blow at irregular intervals. For three hours

"The flukes of a big humpback just disappearing below the surface on the starboard side."

we kept up a fruitless chase after first one and then another of the humpbacks, once or twice getting so close that a shot seemed imminent. At last the Captain, who had come on deck, said:

"It's no use to bother with these fellows; there is no feed and we may stay here all day without killing; we'll go over toward Fanshaw, and see if we can't find another bunch."

Two hours of steaming brought us in sight of Storm Island and far over near the shore we could see several spouts. Now and then flukes would show as one of the animals went down, indicating to my satisfaction that some, at least, were humpbacks. When we neared the whales I left the bridge, making my way forward along the deck to the harpoon-gun, and with camera ready braced myself against a rope. The steamer was pitching furiously and it was all I could do to keep my feet, but clinging to a line with one hand and shielding the lens of my camera with the other, I awaited the reappearance of a whale that had gone down on the starboard side.

Suddenly the gunner shouted, "There he comes!" and pointed over the bow where the water was beginning to smooth out in a large, green patch about thirty fathoms away.

Before I could focus my camera, the whale had burst into view, sending his spout fifteen feet into the air. Evidently he saw us for he was down again in a second, only to reappear several fathoms astern. Time after time he showed himself, never near enough for a shot but keeping me busy exposing plates.

After about an hour another humpback appeared beside him and together they seemed to be enjoying to the fullest extent the game of tag they were playing with us. Once the larger of the two threw himself clear out of the water, showing even the tips of his flukes, and fell back with a splash which sounded like the muffled clap of two great hands.

Again he thrust his head into the air and, whirling about, I caught him with the camera just before he sank back out of sight.

For over an hour the game of tag continued, but once, when the whales had been down an unusually long time, the Captain swung the vessel's nose into

"The captain swung the vessel's nose into just the right position and they appeared close beside the starboard bow."

just the right position and they appeared close beside the starboard bow. The roar of the gun almost deafened me and instinctively I pressed the button of the camera, but a wave had thrown the steamer into the air at just the wrong time and the harpoon struck the surface several feet below the whale. Both ani-

mals went down churning the water into foam, and when next we saw them they were close together, far astern.

Although the chase had been an aggravation to the whalers, I had reaped a harvest of pictures and had exposed every plate in the holders. While Sorenson, the gunner, was reloading the gun, I descended into the hold, substituted fresh plates, and packed the others in the pasteboard boxes. My work was hastened by the sudden stopping and starting of the engines which proclaimed that another whale had been sighted and the chase already begun.

Pushing away the hatch which covered the entrance to the hold, I swung up the steep ladder to the deck above. Sure enough a big humpback was spouting only a short distance away, now and then rolling on his side and throwing his great black and white fin in the air.

"He's feeding," said Sorenson, as I stepped up beside him; "but he's pretty wild. Perhaps we'll kill this time."

Back and forth for two hours we followed the animal, sometimes getting so close that when I saw him burst to the surface I held my breath, expecting to hear the roar of the gun beside me; but Sorenson, somewhat chagrined by his miss at the last whale, wished to be sure of this shot and would not take a chance. The Captain swung the boat in a long circle each time the animal disappeared and it seemed almost certain that we would at last be near when he came up. And so it happened, for when we had

"Scrambling up, I . . . snapped the camera at the huge body partly hidden by the boat."

almost despaired of getting a shot the man in the barrel shouted, "He's coming, right below us."

Looking down into the water I could see the ghostly form of the whale rising to the surface with tremendous force just in front of the bow. There was no time to stop the ship and the animal burst from the water half under the vessel's side. I started back, shielding my camera from the spout, and, stumbling over a pile of chains on the deck, slid almost to the forecastle companionway. Scrambling up, I jumped to the rail and snapped the camera at the huge body partly hidden by the boat.

The whale seemed dazed by his sudden appearance under the steamer, and rolling on his side, went down only a few feet, reappearing ten fathoms away. Sorenson, who had held to the gun, steadied himself, swung the muzzle about, and taking deliberate aim, planted the harpoon squarely behind the fin. It was a beautiful shot, and the whale went down without a struggle. The quiet which followed the deafening explosion was broken only by the soft swish of the line running out from the winch and the men going to their places. I was leaning against the side almost weak from the excitement of the last few minutes when Sorenson, a pleased grin on his sunburned face, turned and said, "I didn't miss him that time, did I? He never moved after I fired."

Four hours more of chasing first one and then another brought the vessel close to a humpback and again Sorenson sent the harpoon crashing into the lungs, killing at the first shot. As the day had been

a tiring one and it was too dark to take pictures, I picked up my camera and climbed down the narrow companionway into the Captain's cabin. After reloading the plate holders I lay down on the bunk listening to the rattling of chains and the tramp of feet on the deck above as the dead whale, with the other

Bringing in a humpback at the end of the day's hunt. The whale's flukes weigh more than a ton.

which had been picked up, was made fast to the bow of the vessel.

The boat had started on the thirty-mile tow to the station and, gradually becoming accustomed to the rolling, I was lulled to sleep by the steady "chug, chug, chug" of the engines and the splashing of the water against the side.

CHAPTER IV

THE "VOICE" OF WHALES AND SOME INTERESTING HABITS

FOR me, developing the photographic negatives after a trip at sea is almost as fascinating as taking them, and no secret treasure chest was ever opened with greater interest than is the developing box. After my first expedition a tank developer was always used, for I invariably became so excited watching the image appear upon the plate that several were ruined by being held too long before the red lamp.

I shall never forget the breathless interest with which I developed the negative exposed when the humpback whale came up beneath the ship during the trip described in the previous chapter. I had had no time to focus the camera, and really expected a blurred picture, but still there was just a chance that it might be good. The image appearing on the plate slowly assumed form and I saw that it was a picture of the great body partly hidden beneath the ship. No one but a naturalist can ever know what it meant to get that photograph and how impatiently I waited until it could be taken from the hypo bath and examined.

I found that the plate had been exposed just after

the spout had been delivered and while the animal was drawing in its breath. The great nostrils were widely dilated and *protruded far above the level of the head.*

This is an excellent illustration of what an important part the camera plays in natural history study, for often a photograph will show with accuracy many things which the eye does not record. When a whale rises so close to the ship that one can almost touch its huge body, the few seconds of its appearance are so full of excitement that it is well-nigh impossible to study details—at least so I have found.

During spouting, and while drawing in the breath, the rush of air through the pipe-like nostrils produces a loud, metallic, whistling sound which, in the larger whales, can be heard for a distance of a mile or more. Since cetaceans have no vocal organs it is probable that this is the sound which is so often mistaken for their voice in the statements that whales have "roared," or "bellowed like a bull."

To me it always seems as though a whale *ought* to have a voice of proportions equal to the animal's bulk. I have never quite recovered from the feeling I had when I first saw a big humpback rise a few feet from the ship. The animal appeared so enormous that if it had uttered a terrifying roar it would have seemed quite the natural and proper thing. The respiratory sounds differ with each cetacean; I have often been near humpbacks and finbacks which were feeding together, and could always distinguish the latter species by the sharper and more metallic quality

of the spout. This is probably due to the fact that the finback, since it is a larger whale, blows with greater force than does the humpback.

The white porpoise (*Delphinapterus leucas*) of the North, makes a most characteristic respiratory noise. It is a sharp "putt" much resembling the exhaust of a small gasoline engine and can be heard for a considerable distance. In early June of 1909, while hunting white porpoises in the St. Lawrence River, a heavy fog dropped on us and for several hours we could only wait for it to lift. All about were white porpoises, probably several hundred, and the sharp "putt, putt" of their spouts came from every direction, sounding like a squadron of gasoline launches.

The number of times the humpbacks spout at each appearance is exceedingly variable. As a general rule, if the feed is far below the surface, requiring a considerable period of submergence, the animals will blow six or seven times before again descending, in order to reoxygenate thoroughly the blood. If, on the contrary, the feed is near the surface, the dives are short and the number of respirations after each one is correspondingly small. And yet I have seen individuals which were "traveling," or swimming for a considerable distance under water, rise to spout but once or twice and again descend.

I have often been asked how long a whale can stay below the surface. It is quite impossible to answer this with a general statement since some species can undoubtedly remain submerged much longer than others. Twenty minutes is my greatest record for

humpbacks but there is no doubt that the animals can stay under a much longer time, if necessary.

A blue whale which we struck off the Japanese coast sounded for thirty-two minutes. In the north of Japan there was a whale of the same species which had had its dorsal fin shot away by a harpoon and had become extremely wild. The animal could be easily recognized by the large white scar on its back, and for three successive years was hunted by various ships of the whaling fleet. He was said to stay below half an hour each time and only spout once or twice between dives. One day, when seventy miles at sea, the ship I was on raised his spout, but after the whale went down we lost him. We were close enough to see the white harpoon scar as he sounded but I did not have a further opportunity to witness his reported eccentricities.

At Ulsan, Korea, Captain Melsom killed a blue whale which stayed below fifty minutes, spouted twenty times, and then went down for forty minutes. The longest period of submergence which I recorded for a finback was twenty-three minutes. There are many tales of the great length of time which the small-toothed whale, called the "bottlenose" (*Hyperoödon rostratum*), will remain under water but I have had no personal experience with this species. It is said that when a bottlenose has been harpooned it not infrequently sounds to a great depth and stays below for over an hour.

Many whalemen believe that cetaceans can remain under water for a long time without coming up to

breathe. This owes its origin to the fact that whales will suddenly appear when for several hours previously there has been no sign of a spout even at a distance. Captain Grahame first called my attention to this fact and since then I have personally witnessed it twice.

Once, when sixty miles at sea off the Japanese

"Suddenly, not more than two hundred fathoms in front of the ship, four humpbacks spouted and began to feed." The flukes of one are shown, in the distance is a second which has just spouted, and the smooth patches of water where the other two descended are seen in the foreground.

coast, trouble with the engines caused the ship to lie to for about three hours. During most of that time I was in the barrel at the masthead watching with glasses a school of porpoises (*Lagenorhynchus obliquidens*), which were playing about some distance from the ship. As far as I could see there was not the slightest sign of a whale nor had there been for

at least two hours. Suddenly, not more than two hundred fathoms in front of the ship, four humpbacks spouted and began to feed. They remained for almost half an hour in our immediate vicinity, wallowing about at the surface, and then, as at a signal, arched their backs, drew out their flukes, and sounded. They rose again about half a mile away, spouted a few times and disappeared.

There is not one chance in ten that those whales could have blown within five miles of the ship, when they first appeared, without being seen. The ocean was as calm as a millpond and the sun so brilliant that the spouts glittered like a cloud of silver dust thrown into the air. From the masthead I could see for miles and had, moreover, been watching the water in every direction as the porpoises circled and played about the ship.

Practically the same thing has been reported to me at various times from other localities. Captain Grahame said that in Alaska at a certain place in Frederick Sound a school of finbacks used to appear suddenly every day about four o'clock in the afternoon. The whalemen seemed to be of the opinion that the animals had been under the water for some hours, perhaps sleeping on the bottom.

From what is known of the physiology of cetaceans this is highly improbable if not actually impossible. To me the most reasonable explanation seems to be the one advanced by Rocovitza, viz., that some species of whales frequently swim long distances at considerable speed without appearing to

blow. When there is little feed and the whales are constantly moving, or traveling, I have seen them rise a mile or more from the place where they last disappeared, spout a few times and again go down, repeating this as long as they could be seen from the ship. There is no valid reason why the animals should not continue for half an hour or more without appearing to blow and during that time even slow swimmers, such as humpbacks, could cover three or four miles.

One day at Ulsan, Korea, Captain Hurum found two humpbacks and struck one. Captain Melsom who was but a short distance away came up at once and stood by to shoot the second whale. But that individual had absolutely disappeared and although the sea was calm and both ships kept a sharp watch was never seen again. Captain Melsom says it must certainly have swum five miles without rising to spout.

When and where whales do sleep we have no means of knowing. They have been recorded as following ships for great distances, always keeping close by, and I have often heard them blow at night. My own theory is that they sleep while floating at the surface, either during the day or night, but I have little evidence with which to sustain it.

Whales must have some means of communicating with each other of which we know nothing, for often the members of a school, even when widely separated, will leave the surface together and reappear at exactly the same instant.

At times two whales will swim so closely together

that their bodies are almost touching and this habit has given rise to stories, vouched for by reputable scientific men, about an unknown whale with two dorsal fins. I could never bring myself to believe these tales and often wondered how they originated, until one day, while hunting off the coast of Japan with Cap-

Two humpback whales swimming close together at the surface. These animals were feeding and coming up to spout every few seconds.

tain Anderson, we saw a so-called "double-finned" whale. A big finback was spouting in the distance and as we were following a sei whale which was very wild, the Captain decided to see if we could get a shot at the new arrival.

The whale was swimming at the surface and as we neared the animal two dorsal fins were plainly visible. Anderson was as excited as I because it seemed that we would certainly "get fast" to the mythical whale. We watched every movement of the animal as it slowly crossed our bows and we could

see the second dorsal fin about two feet behind the first.

Suddenly the animal spouted in a way that was unfamiliar to both of us, for the vapor column was very thick and plainly divided. We were within forty fathoms, almost near enough for a shot, before I realized that our strange cetacean was really two whales —a cow finback and her nearly grown calf. The latter was on the far side of the mother and was pressed closely to her side. Its dorsal fin appeared just behind that of its parent and while the whale was broadside to us we could see no other part of the calf's body. Had we not been following the animal I should forever have been convinced that I had actually seen a double-finned whale.

CHAPTER V

THE PLAYFUL HUMPBACK

THE first whale which I ever saw "breach," or jump out of the water, was a humpback in Alaska. We raised the whale's spout half a mile away and ran up close before the animal sounded. It seemed certain that he would blow again, and with engines stopped the ship rolled slowly from side to side in the swell. The silence was intense and our nerves were strained to the breaking point.

Ten minutes dragged by; then, without a sound of warning, the floor of the ocean seemed to rise and a mountainous black body, dripping with foam, heaved upward almost over our heads. It paused an instant, then fell sideways to be swallowed up in a vortex of green water. With the camera ready in my hands I stared at the thing. It might have been an eruption of a submarine volcano or a waterspout; I would as soon have thought of photographing either. Even the nerves of Sorenson, the harpooner, were shaken and he clung weakly to the gun without a move to use it.

The whale had dropped back scarcely twenty feet away; if it had fallen in the other direction the vessel would have been crushed like an eggshell beneath its forty tons of weight. Never since then have I

known of a whale breaching so close to a ship, although they have frequently come out within a hundred and fifty feet.

A few days later we had sighted a lone bull humpback early in the afternoon and for two hours had been doing our utmost to get a shot. The whale seemed to know exactly how far the gun was effective and would invariably rise just out of range. Once he sounded forty fathoms ahead and, as I stood waiting near the gun platform with the camera ready, suddenly the water parted directly in front of us and with a rush which sent its huge body five feet clear of the surface the whale shot into the air, fins wide spread, and fell back on its side amid a cloud of spray.

I was watching for the animal on the starboard bow but managed to swing about with the camera and press the button just before he disappeared. Although the photograph was hardly successful, nevertheless it is interesting as being the only one yet taken of a breaching humpback; it shows the whale breast forward falling upon its right side.

Humpbacks probably breach in play and sometimes an entire school will throw their forty-five-foot bodies into the air, each one apparently trying to outdo the others. For some reason the humpbacks of Alaska and the Pacific coast seem to breach much more frequently than do those in Japan waters.

This species is the most playful of all the large whales—one of the reasons why to me they are the most interesting. Breaching is probably their most

spectacular performance but what the whalers call "lobtailing" is almost as remarkable. The animal assumes an inverted position, literally standing upon its head, and with the entire posterior part of the body out of the water begins to wave the gigantic flukes back and forth. The motion is slow and measured

A humpback whale "lobtailing." The animal assumes an inverted position and, with the entire posterior part of the body out of the water, begins to wave the gigantic flukes back and forth, lashing the water into foam.

at first, the flukes not touching the water on either side. Faster and faster they move until the water is lashed into foam and clouds of spray are sent high into the air; then the motion ceases and the animal sinks out of sight. There is considerable variety to the performance, the whale sometimes pounding the water right and left for a few seconds and then going down.

Many of the gunners believe that lobtailing is indulged in to free the whale's flukes from the barnacles which fasten in clusters to the tips and along the

edges. I do not believe that this supposition can be correct for the barnacles are embedded too firmly in the blubber to be dislodged by such beating. That the animals come into shallow water and rub against rocks to rid themselves of parasites, as whalemen report, seems much more probable.

The playful disposition of these whales is manifested in other ways. Very frequently when a ship is hunting a single humpback the animal will play tag with the vessel. It will come up first on one side and then on the other; "double" under water and rise almost at the stern; thrust its head into the air or plunge along the surface with half the body exposed but always just out of range of the harpoon-gun. Sometimes this will last for two or three hours or until the whale is killed; at others the animal will seem to tire of the game and with a farewell flirt of its tail dive and swim away.

Captain Scammon says:

> In the mating season they are noted for their amorous antics. At such times their caresses are of the most amusing and novel character, and these performances have doubtless given rise to the fabulous tales of the swordfish and thrasher attacking whales. When lying by the side of each other, the Megapteras frequently administer alternate blows with their long fins, which love-pats may, on a still day, be heard at a distance of miles. They also rub each other with the same huge and flexible arms, rolling occasionally from side to side, and indulging in other gambols which can easier be imagined than described.[1]

[1] "The Marine Mammals of the North-western Coast of North America." By Charles M. Scammon, p. 45.

The animals of which I have thus far been writing are classified in the suborder *Mystacoceti,* or whalebone whales, and are distinguished from the suborder *Odontoceti,* or toothed whales, by the possession of two parallel rows of thin, horny plates which hang from the roof of the mouth. These plates, commercially called whalebone but properly known as baleen, are growths from the skin much like the claws, finger or toenails of land mammals and are not composed of bone but of a substance called "keratin." Each plate is roughly triangular, being wide at the base and narrow at the tip, and has the inner edges frayed out into long fibers; these hair-like bristles form a thick mat inside the mouth and thus the small shrimps and other minute food upon which the baleen whales feed are strained out and eaten. The development of whalebone is one of the most remarkable specializations shown by any living mammal The baleen is, in reality, merely an exaggeration of the cross ridges found in the roof of the mouth of a land mammal and a somewhat similar straining apparatus is present in a duck's bill.

The great majority of people believe that all large whales eat fish whereas none, except the sperm whale, does so when other food is to be obtained. All the baleen whales eat small crustaceans and especially the little red shrimp (*Euphausia inermis*), which is about three-quarters of an inch long. These minute animals float in great masses, sometimes near the surface but often several fathoms below it, and the move-

ments of the whales are very largely determined by their position and abundance.

The feeding operations are most interesting to watch, and if the shrimps happen to be but a short distance under water, as often happens during the

The tongue of a humpback whale, which has been forced out of the animal's mouth by air pumped into the body to keep it afloat.

morning and evening or just before a storm, they can be easily seen. The whale starts forward at good speed, then opens its mouth and takes in a great quantity of water containing numbers of shrimp, turns on its side and brings the ponderous lower jaw upward, closing the mouth. The great soft tongue, fill-

ing the space between the rows of baleen, expels the water in streams, leaving only the little shrimp which have been strained out by the bristles on the inner side of the whalebone plates.

The fins and one lobe of the flukes are thrust into the air as the mouth is closed, and sometimes the animal rolls from side to side. At this time the whales are careless of danger and pay not the slightest attention to a ship. The quantity of shrimp eaten by a single whale is enormous. I have taken as much as four barrels from the stomach of a blue whale which even then was by no means full. Probably when shrimp are very scarce or are not obtainable, all the fin whales eat small fish, but during the last eight years I have personally examined the stomachs of several hundred finners and found fish in only four or five individuals.

Humpbacks, like all the large whales, show great affection for their young and many touching stories are told of their devotion. If a female with her calf is seen the whalemen know that both can be secured and often shoot the calf first, if it is of fair size, for the mother will not leave her dead baby.

This affection is reciprocated by the calf, as the following incident, related by J. G. Millais, Esq., will show:

Captain Nilsen, of the whaler *St. Lawrence,* was hunting in Hermitage Bay, Newfoundland, in June, 1903, when he came up to a huge cow humpback and her calf. After getting "fast" to the mother and seeing that she was exhausted, Captain Nilsen gave the order to lower the "pram" for the

purpose of lancing. Every time the mate endeavored to lance the calf intervened, and by holding its tail toward the boat and smashing it down whenever they approached, kept the stabber at bay for half an hour. Finally the boat had to be recalled for fear of an accident, and a fresh bomb harpoon was fired into the mother, causing instant death. The faithful calf now came and lay alongside the body of its dead mother, where it was badly lanced but not killed. Owing to its position it was found impossible to kill it, so another bomb harpoon was fired into it. Even this did not complete the tragedy and it required another lance stroke to finish the gallant little whale.[1]

Captain H. G. Melsom tells me that in Iceland a female humpback was killed, and her calf would not leave the ship which was towing its dead mother but followed the vessel until it was close to the station.

Humpbacks have a bad reputation among the Norwegians and it is seldom that a boat is sent out to lance a whale of this species. The gunners say that there is too much danger in the flukes and long flippers and that sad experience has given them a wholesome respect. Usually, if the animal is too "sick" to require a second harpoon it will be drawn close up beside the ship and lanced from the bow.

From personal experience I have only negative evidence to offer as to the fighting qualities of this whale for, although I have seen a great many killed, never did one give much trouble. They certainly cannot drag a vessel as a blue whale or finback will, and apparently do not like to pull very hard against the

[1] "The Mammals of Great Britain and Ireland." By J. G. Millais. Longmans, Green, & Co., p. 238.

iron. I have seen humpbacks, which were being drawn in for the second shot, squirm and give way each time the rope was pulled taut. I do not pretend to deny, however, the widespread and probably well-founded belief in the danger of coming to close quar-

Pulling the barnacles off a humpback whale. This species is infested with parasites, which fasten in clusters to the throat, head, fins and flukes.

ters with this whale and will again quote Millais in regard to this:

Humpbacks sometimes give trouble when struck too high in the body or only slightly wounded, and several serious accidents have occurred both to steamers and to the men in the small "prams" when trying to lance the wounded whale.

The following authentic instances have been given to me by Norwegian captains:

In May, 1903, the whaling steamer *Minerva,* under Captain John Petersen, hunting from the station in Isafjord, made up to and struck a bull Humpback. The beast was wild, so they fired two harpoons into it, both of which were well placed. In the dim light the captain and two men went off in the "pram" to lance the wounded Whale, when the latter suddenly smashed its tail downwards, breaking the boat to pieces, killing the captain and one man, and breaking the leg of the other. The last-named was, however, rescued, clinging to some spars.

A most curious accident happened on the coast of Finmark about ten years ago. A steamer had just got fast to a Humpback, which, in one of its mad rushes, broke through the side of the vessel at the coal bunkers, thus allowing a great inrush of water which put out the fires and sank the ship in three minutes. The crew had just time to float the boats, and was rescued by another whaler some hours later.

Owing to its sudden rushes and free use of tail and pectorals the Humpback is more feared by the Norwegian whalemen than any other species, although fewer casualties occur than in the chase of the Bottlenose. It is not to be wondered at when you ask a Scandinavian about the dangerous incidents of his calling he will invariably answer, "I not like to stab de Humpback; no, no, no!" The Humpback generally sinks when killed, and is a difficult Whale to raise.[1]

Reliable data upon the breeding habits of all large whales are obviously difficult to secure and, except in the case of the California gray whale, it is im-

[1] "The Mammals of Great Britain and Ireland." By J. G. Millais. Longmans, Green, & Co., pp. 241-242.

possible to state with certainty many facts upon this subject. Probably the period of gestation in the humpback is about one year and the calves are from fourteen to sixteen feet long when born. On June 16, 1908, at Sechart, a young humpback was killed

A humpback partly in the water at the station in North Japan. The whale is lying on its side with the breast and flipper showing.

with its mother. The calf had nothing but milk in its stomach and milk was flowing from both teats of the parent. I estimated that this baby humpback was about three months old and since birth had probably almost doubled its length.

Although all the fin whales probably mate chiefly in the early spring, nevertheless pairing is deferred

until later in the year among some individuals, as fœtal specimens show. Pregnant females always have very thick, fat blubber and yield a large amount of oil. Except in very rare cases all the large whales have but one young at a birth and although several instances of humpback twins have been recorded it is certainly very unusual.

How long the calf lives upon milk is problematical, but it can hardly be more than six months. The rate of growth of large whales is so exceedingly rapid that the calf would undoubtedly be able to care for itself very soon after birth.

The two teats of all cetaceans are concealed in slits on either side of the genital opening. In a humpback whale each teat is the thickness of a man's thumb and two inches long. In the female humpback taken at Sechart with the nursing calf, the milk glands under the blubber had become greatly enlarged and were like an elongated oval in shape; they were 4 feet 6 inches long, 42 inches wide at the lower, and 9 inches at the upper, end.

By suddenly pressing the surrounding muscles the milk could be ejected 2 or 3 feet in a fair sized stream and it is in this way that the calf probably receives it. The young whale's mouth is so constructed that it is impossible for the animal to suck, in the ordinary sense of the word, and the teat is much too short, even when protruded two or three inches, to be held between the thick, rounded lips. When the milk is ejected into the calf's mouth apparently considerable sea water must go with it unless the mother

lifts that portion of her body out of the water while the baby is nursing, which is probably the case.

The milk itself looks exactly like cow's cream. I once drew out about a gallon from a humpback and tasted it. It was very disagreeable, but I imagine that little of the original flavor was left, for the whale had been killed about fourteen hours before and the milk had not only soured but was also permeated with the gases of decomposition. I am quite sure that if fresh the milk would not be at all bad, and stories are told (which, however, I have never substantiated and greatly doubt) that when at sea the Norwegians sometimes use on the table milk from a freshly killed whale.

A remarkable account of whale milking was published in a New York newspaper and had such a wide circulation that the facts may be of interest. It seems that a reporter was sent to interview Dr. F. A. Lucas, who had recently been at Newfoundland to secure a blue whale's skeleton for the United States National Museum, and during the conversation Dr. Lucas jokingly remarked that it would be a fine idea to entice two or three whales into a narrow bay, bar the entrance with posts, and anchor a carcass inside. This would attract great numbers of small crustaceans and give food for the captive whales. The animals might then be trained to come to a wharf morning and evening and submit to being milked. Thus the problem of "the high cost of milk" for an entire village might easily be solved.

The reporter was certain that this would fill his

editor's idea of a whale story, but when writing it neglected to state that his data were purely imaginary.

The result of a single day's hunt. Five humpback whales at Sechart, Vancouver Island.

The story was copied in papers throughout America and for months afterward I was deluged with letters asking who the successful whale trainer might be.

CHAPTER VI

JAPANESE SHORE STATIONS

IN the summer of 1909, after a short expedition to the St. Lawrence River to hunt white porpoises, I joined the *U. S. S. Albatross* in the Philippines as a special naturalist for a cruise among the islands of the Dutch East Indies.

It was an exceedingly interesting trip, but even though sailing over ground where thousands of sperm whales had been killed in years gone by, not a spout was seen. We raised our first whales at the southern end of Formosa late in January, while steaming northward to Japan. They were two humpbacks, lazily rolling about in a deep bay where we had anchored to escape a typhoon which was roaring along the coast outside, and showed us that we were on the edge of the Japan whaling banks, famous among all deep-water sailors.

In February the *Albatross* reached the beautiful harbor of Nagasaki and while wandering about the streets of the picturesque little city I saw great quantities of whale meat on sale in the markets. Peddlers were also doing an excellent business in selling meat and blubber from house to house, and altogether Japanese whaling appeared to be in a flourishing condition.

Since absolutely nothing was known, scientifically or otherwise, about the large whales of this coast, I determined to leave the *Albatross* and investigate the fishery as well as to secure specimens for the Museum, if possible.

"In some instances the whales are drawn out upon the slip in the Norwegian way."

In Shimonoseki, where one of the offices of the whaling company is located, I found the president of the Toyo Hogei Kabushiki Kaisha (Oriental Whaling Company, Ltd.) most cordial in his attitude toward my proposed work. He offered to assist me in every possible way, and a few days later I boarded a little Japanese freight steamer which all day and night

plowed her way through the beautiful islet-dotted waters of the Inland Sea to Oshima, famous in Japanese history.

At Oshima I made my home with Mr. Ikeda, the manager, and his wife, in a delightful little house built into the side of a hill which overlooked the beautiful bay with the village of Kishimoto on the opposite shore. I have lived with many people in many lands while wandering about the world, but never have I had a host or hostess who did more to further my work and personal comfort than these two delightful Japanese.

The whales are handled in such an unusual way in Japan that there was much to learn about the industry itself. The stations are usually situated not far from the feeding grounds of the animals, in or near one of the little fishing villages which dot the coast in every bay or harbor. Eight or ten large wooden buildings compose the factory, and there is always a long wharf projecting into deep water, at the end of which stand upright a pair of long heavy poles inclined forward and joined at their extremities by a massive crosspiece; from this are suspended the blocks through which run wire cables from the steam winch.

In some instances the whales are drawn out upon the slip in the Norwegian way, but the more usual Japanese method is a modification of that used by the deep-sea whalers; the animals are cut in while lying in the water, the poles at the end of the wharf being substituted for the masts of a ship.

Late in the morning on the day after I arrived at Oshima the long-drawn wail of a siren whistle sounded far down the bay, and in a few moments a little whaling vessel swept proudly around a picturesque rocky headland and steamed swiftly toward the station. She was listing far to starboard and

"She was listing far to starboard and we could see the huge flukes of a blue whale . . . waving at her bow."

we could see the huge flukes of a blue whale, the *shiro-nagasu kujira* of the Japanese, waving at her bow, the carcass stretching alongside almost to the stern.

She slipped quietly up to the end of the wharf and two cutters sculled a sampan out to meet her. There

were a few hoarse shouts, a sharp command, the rattle of a heavy chain, and a great splash as the whale was dropped into the water.

On shore the station bell was clanging and men were assembling on the wharf; strong well-built fellows they were, many of them half naked and busy

"A steel wire cable was looped about the tail just in front of the flukes, and the huge carcass drawn slowly upward over the end of the wharf."

sharpening the blades of murderous-looking knives. With them mingled dozens of women and girls clad in tight blue trousers and kimonas, each one armed with a stout iron hook or with carrying racks slung over their shoulders.

In a few moments the rattling steam winch had

brought the whale close in shore, a steel wire cable was looped about the tail just in front of the flukes, and the huge carcass drawn slowly upward over the end of the wharf.

As it rose the eager cutters attacked it savagely with their long-bladed knives, slicing off enormous blocks of flesh and blubber which were seized by "hook men" almost before they fell, passed to the women, and drawn to the back of the platform.

Meanwhile two other cutters in a sampan were at work dividing the carcass just in front of the dorsal fin. The entire posterior part of the whale was then drawn upward and lowered on the wharf to be stripped of blubber and flesh. Transverse incisions were made in the portion of the body remaining in the water, a hook was fastened to a "blanket piece," and as the blubber was torn off by the winch the carcass rolled over and over. The head, disjointed at the neck, was hoisted bodily upon the pier. Section by section the carcass was cut apart and drawn upward to fall into the hands of the men on the wharf and be sliced into great blocks two or three feet square.

The scene was one of "orderly confusion"—men, women and girls, laughing and chattering, running here and there, sometimes stopping for a few words of banter but each with his or her own work to do. Above the babel of sounds, the strange, half wild, meaningless chant, "Ya-ra-cu-ra-sa," rose and died away, swelling again in a fierce chorus as the sweating, half-naked men pulled and strained at a great jaw-

"Section by section the carcass was cut apart and drawn upward to fall into the hands of the men on the wharf and be sliced into great blocks two or three feet square."

bone or swung the hundred-pound chunks of flesh into the waiting hand cars which carried them to the washing vats. Sometimes a kimona-clad, bare-footed girl slipped on the oily boards or treacherous, sliding, blubber cakes and sprawled into a great pool of blood, rising amid roars of laughter to shake herself, wipe the red blotches from her little snub nose and go on as merrily as before.

It was essentially a good-natured crowd, working hard and ceaselessly but apparently deriving as much fun from their labor as though it were a holiday. The spirit of the place was infectious, and as I splashed about in the blood and grease, I talked and joked with the cutters in bad Japanese, causing screams of laughter when I seriously informed them that "the sun was very hot water" by the quite natural mistake of substituting the word *atsui-yu* for *atsui* (hot).

Almost every night we would be awakened by the siren whistle bringing the news of more whales. If I did not at once stir, the little *amah* (maid), always devoted to my interests, would quietly slide back the paper screen to the sleeping room and say, *"Andrews-san, go Hogei wa kujira ga torri mashita"* (Hogei No. 5 has caught whales). When I had rolled out of the comfortable *futons* and begun to dress, I would hear little Scio-san pattering about in the other room, gathering my pencils, notebook, and tape measure. Looking like a beautiful night-moth in her bright-colored kimona, with the huge bow of her *obi* (sash) always neatly arranged, she would be there to help me

into the greasy oilskins and rubber boots, and would clump along in front to the wharf, lighting the way with a *chochin* (paper lantern) that I might not bump

"Transverse incisions were made in the portion of the body remaining in the water, a hook was fastened to a 'blanket piece' and as the blubber was torn off by the winch the carcass rolled over and over."

my head on the eaves and rafters of the low station shed.

Every day Scio-san religiously went to her ugly little stone joss in the playhouse temple on the hillside and prayed that the "American-san" might catch many whales and porpoises for the *hakubutsu-kwan* (museum) in the wonderful fairy city across the Pa-

cific, of which he had so often told her. And when the season was ended and she had ventured to ask the American-san himself to thank the joss, and to please her he had done so, her joy could hardly be contained and the tip of her little nose was almost red from constant rubbing on the *tatami* (floor matting) in her bows of thanks and farewell.

Even though it was the very middle of the night when a ship's whistle sounded, long before the whale had been dropped at the wharf paper lanterns, flashing like fireflies, would begin to shine and disappear among the thatched-roofed cottages and the crowd of villagers gathering at the end of the wharf. Half-naked men, child-faced geishas, and little youngsters carrying sleeping babies as large as themselves strapped to their backs, formed a curious, picturesque, ever changing group.

Fires of coal and fat in iron racks along the wharf threw a brilliant, yellow light far out over the bay filled with whale ships, heavy, square-sterned fishing-boats and sampans, and gave weird fantastic shapes to the cutters as it glistened on their dripping knife blades and danced over the pools of blood. But the work always went on as quickly as in the daytime, no matter what the hour or weather, for the meat and blubber must be hurried on board fast transports and sent to the nearest city to be sold in the markets and peddled from house to house.

Few people realize the great part which whale meat plays in the life of the ordinary Japanese. Too poor to buy beef, their diet would include little but rice,

fish, and vegetables, were it not for the great supply of flesh and blubber furnished by the huge water mammals. In winter, if there is little fish to be had, the meat of the humpback whale, which is most highly

The inner side of a strip of blubber as it is being torn from a whale.

esteemed, sometimes brings as much as thirty *sen* (fifteen cents) per pound; but this is very unusual and ordinarily it can be bought for fifteen *sen* or less. But the edible portions are not only the flesh and blubber. The heart, liver, tongue, intestines, and

other parts of the viscera are prepared for human consumption, and what little remains is first tried out to extract the oil, then chipped by means of hand knives, and dried in the sun for fertilizer.

Whale meat is coarse grained and tastes something

"What . . . remains is first tried out to extract the oil, then chipped by means of hand knives, and dried in the sun for fertilizer."

like venison but has a flavor peculiarly its own. I have eaten it for many days in succession and found it not only palatable but healthful. In fact a chemical analysis shows it to contain about 98 per cent. of digestible material, whereas ordinary beef has seldom more than 93 per cent. The Japanese prepare it in a variety of ways but perhaps it is most frequently chopped finely, mixed with vegetables, and

eaten raw, dressed with a brown sauce called *shoyu*.

In the summer when it is impossible to ship the meat long distances because of the heat, much of it is canned. The flesh is cooked in great kettles and the cans made, packed, and labeled at the stations; the meat is then shipped to all parts of the Empire.

Whale meat on the washing platforms ready to be sent to market.

It is most unfortunate that prejudice prevents whale meat from being eaten in Europe and America. It could not, of course, be sent fresh to the large cities, but canned in the Japanese fashion it is vastly superior to much of the beef and other tinned foods now on sale in our markets. In New Zealand, the Messrs. Cook Brothers, who have developed the

method of capturing humpback whales in wire nets (described in the Introduction), can a great deal of meat and ship it to the South Sea Islands, where it is sold to the natives.

The baleen of the fin whales, which is of little value in Europe and America, has been put to many uses by the Japanese. When I visited the exhibition rooms of the Toyo Hogei Kabushiki Kaisha in Tokyo, I was astonished and delighted at the cigar and cigarette cases, charcoal baskets, sandals, and other beautiful things created by their clever brains and skillful fingers from the material which in the hands of Western nations seems to be almost useless.

CHAPTER VII

A JAPANESE WHALE HUNT

AFTER spending a delightful month at Oshima, where three fine whale skeletons were secured, I returned to Shimonoseki to send them to New York, and then traveled northward to Aikawa, three hundred miles from Tokyo. Aikawa is a typical little fishing village, situated at the end of a beautiful bay which sometimes harbors as many as fourteen whale ships from the four neighboring stations.

In the early spring finbacks and an occasional blue whale are taken there, but in June and July sei and sperm whales arrive in great numbers. The sei whale (the *iwashi kujira,* or sardine whale of the Japanese) is an exceedingly interesting species which, to the scientific world, had been unknown in the Pacific Ocean until my visit, although it had formed the basis of the Japanese summer fishery for twelve or fifteen years. My first hunt for sei whales resulted in a very exciting experience and one which in modern whaling is comparatively rare.

A series of violent storms which kept the ships inside had been raging along the coast, but at last the clouds began to break one evening and gather into great fleecy mountains of white, now and then drifting away enough to show the moon behind. The bad

weather had apparently ended and at ten o'clock I went aboard the *Hogei Maru No. 5* as the guest of Captain Y. E. Andersen.

A streak of brilliant sunshine playing across my face from the skylight awakened me at five o'clock in

The whaling station at Aikawa, North Japan. "Aikawa is a typical little fishing village, situated at the end of a beautiful bay which sometimes harbors as many as fourteen whale ships from the four neighboring stations."

the morning. The ship was rolling along in a moderate swell, but the patch of sky which shone through the open square above my head was as blue as the waters of a tropic sea. Captain Andersen was still asleep, and I had just decided to dress and go on deck when the cabin boy ran hurriedly down the companionway and called *"Kujira"* (whale). In five minutes we were both on deck, and upon reaching the

A sei whale on the slip at Aikawa. This species is allied to the finback but is smaller.

bridge I said to the man at the wheel, *"Kore wa nani desu ka?"* (What kind is it?)

He replied in Japanese: "I don't know yet; sperm, I think."

I was tremendously excited at this for I wished

The spout of a sei whale. The column of vapor shoots straight upward and is lower and less dense than that of the finback.

above all things to get at close quarters with a school of sperm whales, which, off this coast, often numbers several hundred individuals. I strained my eyes through a powerful field glass, sweeping the sea ahead to catch sight of a spout which would tell the story. Suddenly it came, about a mile ahead, and we both exclaimed, *"Iwashi kujira!"* (Sardine whale!) for the column of vapor shooting straight upward and drift-

ing slowly off on the wind was strikingly different from the puff-like blow of the sperm.

We were running at full speed toward the animal, which was spouting every ten or fifteen seconds. Andersen was forward superintending the

"He . . . would sometimes swim just under the surface with only the tip of the dorsal fin exposed."

loading of the gun and inspecting the harpoon rope which lay coiled on the heavy iron pan at the bow.

"He's a good whale," the Gunner called out to me. and by that he meant that we would soon get a shot because the animal was spouting so frequently. He was never down longer than five minutes, and would sometimes swim just under the surface with only the tip of the dorsal fin exposed. At other times his course could be followed by patches of smooth, green

water which spread out in a broad trail behind him.

The gun had hardly been loaded before we were close to the whale, with the engines at dead slow, waiting for him to come up. I had taken out one of the lenses of my camera but decided that the light was not yet strong enough for the use of the single combination since the shutter would have to be operated at a high speed. Sitting down upon a tool box near the rail, I began hurriedly to replace the back lens and was just screwing it into position when "who-o-o" came the spout, not five fathoms from the stern of the ship.

We all jumped as though a bomb had been exploded beside us and I nearly dropped the camera in my excitement. Somehow I managed to get the lens readjusted without accident, and stood ready with my arm around a rope just behind the gun platform. Before the ship swung about the whale had spouted two or three times and gone down. We hardly breathed while waiting and my nerves were so on edge that I almost released the shutter of the camera when the silence was broken by the voice of the Bo's'n from the "top" singing out, "He's coming, he's coming!"

"I can't see him!" shouted the Gunner.

"There, there, on the port bow!" came the answer from aloft.

With a rush the great animal burst to the surface, and I caught a glimpse of the spout in the mirror of my camera as it shot up in a white cloud, glittering in the sunlight.

"Will he shoot?" I thought. "No, no, it is too

far," and I pressed the button of the camera as the broad back came into view.

Almost with the sound of the shutter, and before I had lifted my eyes from the focusing hood, I was deafened by the roar of the gun and enveloped in a great cloud of white smoke. It was impossible to see, but the line could be heard singing over the roller

"I pressed the button of the camera as the broad back came into view."

at the bow and, as the smoke blew away, I caught sight of the high back-fin of the whale cutting the water like a knife.

"Bur-r-r, whip!" went the heavy rope and in a few seconds a hundred fathoms had gone out. Never had I seen a whale run as that one did. The Engineer at the winch was just visible through the haze of smoke which streamed from the brake, and the smell of powder and burning wood hung thick in the air.

The sei whale. From a drawing by J. Henry Blake under the direction of the author.

Suddenly with a swish, up from the hold, fast to the rope, came a wad of brown fishing net that had become entangled in the coil below. I jumped to one side just in time to miss it as it swept by and to see it pass safely over the roller at the bow. It was a

"The winch was then started and the whale drawn slowly toward the ship."

narrow escape, for if it had jammed, the line would surely have snapped and the whale been lost.

The burst of speed was soon ended and the whale sounded for ten minutes, giving us all a chance to breathe and wonder what had happened. When the animal came up again, far ahead, the spout was high and full, with no trace of blood, so we knew that

he would need a second harpoon to finish him. I was delighted, for I had long wished for a chance to get a roll of motion-picture film showing the killing of a whale, and now the conditions were ideal—good light, little wind, and no sea.

I ran below to get the cinematograph and tripod and set it on the bridge while the gun was being loaded. The winch was then started and the whale drawn slowly toward the ship. He persisted in keeping in the sunlight, which drew a path of glittering, dancing points of light, beautiful to see but fatal to pictures. I shouted to Captain Andersen, asking him to wait a bit and let the whale go down, hoping it would rise in the other direction. He did so and the animal swung around, coming up just as I wished, so that the sun was almost behind us. It was now near enough to begin work and I kept the crank of the machine steadily revolving whenever it rose to spout. The whale was drawn in close under the bow and for several minutes lay straining and heaving, trying to free himself from the biting iron.

"Stand by! I'm going to shoot now," sang out the Gunner, and in a moment he was hidden from sight in a thick black cloud.

The beautiful gray body was lying quietly at the surface when the smoke drifted away, but in a few seconds the whale righted himself with a convulsive heave. The poor animal was not yet dead, though the harpoon had gone entirely through him. Captain Andersen called for one of the long slender lances which were triced up to the ship's rigging, and after a few

more turns of the winch had brought the whale right under the bows, he began jabbing the steel into its side, throwing his whole weight on the lance. The whale was pretty "sick" and did not last long, and before the roll of motion-picture film had been ex-

A sei whale at Aikawa, Japan. This species is about forty-eight feet long and is allied to the finback and blue whales.

hausted it sank straight down, the last feeble blow leaving a train of round white bubbles on the surface.

Andersen and I went below for breakfast and by the time we were on deck again the whale had been inflated and was floating easily beside the ship. When we had reached the bridge the Gunner said:

"I don't want to go in yet with this one; we'll cruise

about until twelve o'clock and see if we can't find another. I am going up in the top and then we'll be sure not to miss any."

I stretched out upon a seat on the port side of the bridge and lazily watched the water boil and foam

"'There's a whale dead ahead. He spouted six times.'"

over the dead whale as we steamed along at full speed. Captain Andersen was singing softly to himself, apparently perfectly happy in his lofty seat. So we went about for two hours and I was almost asleep when Andersen called down:

"There's a whale dead ahead. He spouted six times."

I was wide awake at that and had the camera open

"The click of the camera and the crash of the gun sounding at almost the same instant." The harpoon, rope, wads, smoke, sparks and the back of the whale are shown in the photograph.

and ready for pictures by the time we were near enough to see the animal—a sei whale—blow. He was spouting constantly and this argued well, for we were sure to get a shot if he continued to stay at the surface. The Bo's'n made a flag ready so that the carcass alongside could be let go and marked. Apparently this was not going to be necessary, for there was plenty of food and the whale was lazily wallowing about, rolling first on one side and then on the other, sometimes throwing his fin in the air and playfully slapping the water, sending it upward in geyser-like jets.

"Half speed!" shouted the Gunner; then, "Slow!" and "Dead slow!"

The little vessel slipped silently along, the propellers hardly moving and the nerves of every man on board as tense as the strings of a violin. In four seconds the whale was up, not ten fathoms away on the port bow, the click of the camera and the crash of the gun sounding at almost the same instant. The harpoon struck the animal in the side, just back of the fin, and he went down without a struggle, for the bursting bomb had torn its way into the great heart.

By eleven o'clock it was alongside and slowly filling with air while the ship was churning her way toward the station. Andersen went below for a couple of hours' sleep in the afternoon, and I dozed on the bridge in the sunshine. We were just off Kinka-San at half-past six, and by seven were blowing the whistle at the entrance to the bay.

Three other ships, the *San Hogei, Ne Taihei,* and

Akebono, were already inside but had no whales. Later Captain Olsen, of the *Rekkusu Maru,* brought in a sei whale, but this was the only other ship that had killed during the day. About eleven o'clock, just

"We were just off Kinka-san at half-past six, and by seven were blowing the whistle at the entrance to the bay."

as I came from the station house after developing the plates, and started to go out to the ship, the *Fukushima* and *Airondo Maru* stole quietly into the bay and dropped anchor. They, too, had been unsuccessful, and, we learned later, had not even seen a whale.

Before we turned in for the night Captain Andersen said to me:

"We'll go sou'-sou' west tomorrow; that's a whale cruise. But I'm afraid there is going to be a big sea

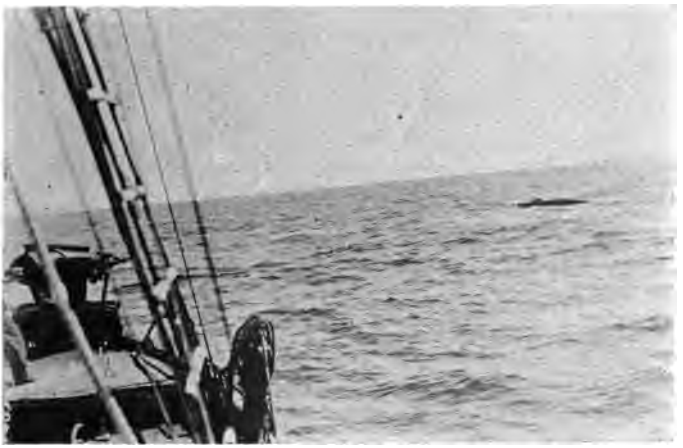
on, for the wind has shifted and we always get heavy weather when it's blowing offshore."

The news was not very encouraging, for although I have spent many days on whaling ships I have never learned to appreciate perfectly the charm of the deep when the little cork-like vessels are tossing and throwing themselves about as though possessed of an evil spirit. Each time, I make a solemn vow that if ever I am fortunate enough once more to get on solid ground my days of whaling will be ended.

CHAPTER VIII

CHARGED BY A WILD SEI WHALE

THE ship got under way at two o'clock the next morning, and within half an hour was pitching badly in a heavy sea. At five Andersen and I turned out and climbed to the bridge, both wearing oilskins and sou'westers to protect ourselves from the driving spray. The sun was up in a clear sky, but the wind was awful. The man in the top shouted down that he had seen no whales, but that many birds



"We hunted them for two hours, trying first one and then the other—they had separated—without once getting near enough even for pictures."

were about, showing that food must be plentiful and near the surface. Captain Andersen turned to me with a smile:

"Don't you worry! We'll see one before long. I'm always lucky before breakfast."

Almost while he was speaking the man aloft sang out, *"Kujira!"* The *kujira* proved to be two sei

"He was running fast but seldom stayed down long, his high sickle-shaped dorsal fin cutting the surface first in one direction, then in another."

whales a long way off. When we were close enough to see, it became evident that it would only be a chance if we got a shot. They were not spouting well and remained below a long time.

We hunted them for two hours, trying first one and then the other—they had separated—without once getting near enough even for pictures. It was aggravating work, and I was glad to hear Andersen say:

"We'll leave them and see if we can find some others. They are impossible."

When we came up from breakfast six other ships were visible, some of them not far away and others marked only by long trails on the horizon. We passed the *San Hogci* near enough to hear Captain Hansen shout that he had seen no whales, and then plowed

"Always the center of a screaming flock of birds which sometimes swept downward in a cloud, dipping into the waves and rising again, the water flashing in myriads of crystal drops from their brown wings."

along due south directly away from the other ships. In a short time, one by one, they had dropped away from sight and even the smoke paths were lost where sky and sea met.

It was eleven o'clock before we raised another spout, but this animal was blowing frequently and the great cloud of birds hovering about showed that he was "on feed." He was running fast but seldom stayed down long, his high, sickle-shaped dorsal fin cutting

the surface first in one direction, then in another, but always the center of a screaming flock of birds which sometimes swept downward in a cloud, dipping into the waves and rising again, the water flashing in myriads of crystal drops from their brown wings.

As we came close we saw that the whale was in a school of sardines, the fish frantically dashing here and there, often jumping clear out of the water and causing their huge pursuer a deal of trouble to follow their quick turnings. But he managed his lithe body with wonderful rapidity, and ever before the fish left him many yards behind was plowing after them, his great tail sending the water in swirling green patches astern.

We were going at full speed and came down to half when a hundred fathoms away, but we could not take it slow, for the whale was running directly from us. I got two pictures of the birds and from where I was standing beside the gun could plainly follow the animal in his course. As he rose about sixty fathoms ahead and turned to go down, his back came into view and just behind the fin a large white mark was visible.

"That's a harpoon scar," said Andersen. "It is a bad sign. He may give us a run for it, after all."

The engines were at dead slow now, for the whale had surely seen us and might double under water, coming up astern. Andersen was ready at the gun, swinging the huge weapon slightly to and fro, his feet braced, every few seconds calling out to the Bo's'n aloft, "Miye masu ka?" (Do you see him?)

We had been waiting two minutes (it seemed hours) when the Bo's'n shouted:

"He's coming. He's coming. On the port bow."

In a second the water began to swirl and boil and we could see the shadowy form rise almost to the

A sei whale showing a portion of the soft fatty tongue.

surface, check its upward rush, and dash along parallel with the ship.

"Dame (no good), *dame,* he won't come up!" exclaimed Andersen. *"Mo sukoshi* (a little more) speed, *mo sukoshi* speed! *Dame, dame,* he's leaving us. Half speed, *half* speed!"

Never shall I forget the intense excitement of those few minutes! The huge, ghost-like figure was swim-

"In the mirror of my camera I could see the enormous gray head burst from the water, the blowholes open and send forth a cloud of vapor, and the slim back draw itself upward, the water streaming from the high fin as it cut the surface. Andersen's last words were drowned in the crashing roar of the gun."

ming along just under the surface, not five feet down, aggravatingly close but as well protected by the shallow water-armor as though it had been of steel. Andersen was shouting beside me:

"He won't come, *dame, dame.* Yes, now, now! Look out! I shoot, I *shoot!*"

In the mirror of my camera I could see the enormous gray head burst from the water, the blowholes open and send forth a cloud of vapor, and the slim back draw itself upward, the water streaming from the high fin as it cut the surface. Andersen's last words were drowned in the crashing roar of the gun. Before we could see through the veil of smoke we heard the sailors shout, *"Shinda!"* (dead), and the next instant the black cloud drifted away showing the whale lying on its side motionless. I tried to change the plate in my camera, but before the slide could be drawn and the shutter reset, the animal had sunk. Apparently it had been killed almost instantly, for the rope was taut and hung straight down.

In a few minutes Andersen gave the word to haul away, and the Engineer started the winch. No sooner had the rattling wheels ground in a few fathoms than we saw the line slack and then slowly rise. Faster and faster it came, the water dripping in little streams from its vibrating surface.

In a few seconds the whale rose about ninety fathoms ahead and blew, the blood welling in great red clots from his spout holes. He lay motionless for a moment and then swung about and swam directly toward the vessel. At first he came slowly, but his

speed was increasing every moment. When almost opposite us, about thirty fathoms away, suddenly, with a terrific slash of his tail, he half turned on his side and dashed directly at the ship.

"Full speed astern!" yelled the gunner, dancing about like a madman. *"He'll sink us; he'll sink us!"*

The whale was coming at tremendous speed, half buried in white foam, lashing right and left with his enormous flukes. In an instant he hit us. We had half swung about and he struck a glancing blow directly amidships, keeling the little vessel far over and making her tremble as though she had gone on the rocks; then bumped along the side, running his nose squarely into the propeller. The whirling blades tore great strips of blubber from his snout and jaws and he backed off astern.

Then turning about with his entire head projecting from the water like the bow of a submarine, he swam parallel with the ship. As he rushed along I caught a glimpse of the dark head in the mirror of my camera and pressed the button. An instant later the great animal rolled on his side, thrust his fin straight upward, and sank. It had been his death struggle and this time he was down for good. As the water closed over the dead whale I leaned against the rail trembling with excitement, the perspiration streaming from my face and body. Andersen was shouting orders in English, Norwegian, and Japanese, and cursing in all three languages at once.

I think none of us realized until then just what a narrow escape we had had. If the whale had struck

squarely he would have torn such a hole in the steamer's side that her sinking would have been a matter of seconds. The only thing that saved her was the quickness of the man at the wheel, who had thrown the vessel's nose about, thus letting the blow glance

"Then turning about with his entire head projecting from the water like the bow of a submarine, he swam parallel with the ship."

from her side. It was a miracle that the propeller blades had not been broken or bent so badly as to disable us; why they were not even injured no one can tell—it was simply the luck that has always followed this vessel since Captain Andersen came aboard.

It should not be inferred that the whale deliberately attacked the ship with the intention of disabling her. There is little doubt in my mind but that the animal was blindly rushing forward in his death

flurry, and the fact that he struck the vessel was pure accident. Nevertheless, the results would have been none the less serious if he had hit her squarely.

After a hasty examination showed that the propeller was uninjured, the whale was hauled to the surface.

"I was . . . gazing down into the blue water and waiting to catch a glimpse of the body as it rose, when suddenly a dark shape glided swiftly under the ship's bow."

I was standing on the gun platform gazing down into the blue water and waiting to catch a glimpse of the body as it rose, when suddenly a dark shape glided swiftly under the ship's bow. At first I thought it was only imagination, an aftereffect of the excitement, but another followed, then another, and soon from every side specter-like forms were darting

swiftly and silently here and there, sometimes showing a flash of white as one turned on its side.

They were giant sharks drawn by the floating carcass as steel is drawn by a magnet. Like the vultures which wheel and circle in the western sky far beyond the reach of human sight, watching for the death of some poor, thirst-smitten, desert brute, so these vultures of the sea quickly gathered about the dead whale. I watched them silently fasten to the animal's side, tearing away great cup-shaped chunks of blubber, and shivered as I thought of what would happen to a man if he fell overboard among these horrible, white-eyed sea-ghosts.

Within three minutes of the time when the whale had been drawn to the surface over twenty sharks, each one accompanied by its little striped pilot fish swimming just behind its fins, were biting at the carcass.

"*Dame, dame,* they'll eat my whale up," shouted Andersen in Japanese. "Bo's'n, bring the small harpoon."

One big shark, the most persistent of the school, had sunk his teeth in the whale's side and, although half out of water, was tearing away at the blubber and paying not the slightest attention to the pieces of old iron which the sailors were showering upon him. When the harpoon was rigged and the line made fast, Andersen climbed out upon the rope-pan in front of the gun and jammed the iron into the shark's back. Even then the brute waited to snatch one more mouthful before it slid off the carcass into the water. It

struggled but little and seemed more interested in returning to its meal than in freeing itself from the harpoon, but two boat hooks were jabbed into its gills and it was hauled along the ship's side until it could be pulled on deck. This was no easy task, for

"Two boat hooks were jabbed into the shark's gills and it was hauled along the ship's side until it could be pulled on deck."

it must have weighed at least two hundred pounds and began a tremendous lashing with its tail when the crew hauled away. *"Ya-ra-cu-ra-sa,"* sang the sailors, each time giving a heave as the word *"sa"* was uttered, and the shark was soon flapping and pounding about on deck. The seamen prodded it with boat hooks and belaying pins and I must confess that I

had little sympathy for the brute when the blood poured out of its mouth and gills, turning the snow-white breast to crimson. I paced its length as it lay on the deck, taking good care to miss the thrashing tail and the vicious snaps of its crescent-shaped

Making the sei whale fast to the bow of the ship.

jaws. It measured just twelve feet and, although a big one, was by no means the largest of the school.

When the whale had been finally made fast and the ship started, the shark, now half dead, was pushed over the side. It had not gone ten feet astern before the others of the pack were tearing away at their unfortunate brother with as great good will as they had attacked our whale.

Andersen and I went below to an excellent tiffin, for which I had a better appetite than at breakfast, as the sea had subsided. The course was set for the station to get coal and water for the next day's run, but we could not be in before seven or eight o'clock.

A sei whale swimming directly away from the ship. The nostrils or blowholes are widely expanded and greatly protruded.

The gunner lay down in the cabin for a short nap, and after lighting my pipe I went "top sides" to the bridge. I had been there not more than ten minutes, when "puf-f-f" went a sei whale about two hundred fathoms away on the starboard beam.

The air pumps were still at work inflating the carcass alongside, and the gun had not yet been loaded. Captain Andersen ran forward with the powder charge sewed up in its neat little sack of cheesecloth;

and after the Bo's'n had rammed it home, wadded the gun, and inserted the harpoon, we were ready for work. The vessel had been taking a long circle about the whale, which was blowing every few seconds, and now we headed straight for it.

Like the last one, this animal was pursuing a school of sardines and proved easy to approach. Andersen fired at about fifteen fathoms, getting fast but not killing at once, and a second harpoon was sent crashing into the beautiful gray body which before many hours would fill several hundred cans and be sold in the markets at Osaka. The sharks again gathered about the ship when the whale was raised to the surface, but this time none was harpooned as we were anxious to start for the station.

It was nearly three o'clock when the ship was on her course and fully six before we caught a glimpse of the summit of Kinka-San, still twenty miles away. A light fog had begun to gather, and in the west filmy clouds draped themselves in a mantle of red and gold about the sun. Ere the first stars appeared, the wind freshened again and the clouds had gathered into puffy balls edged with black, which scudded across the sky and settled into a leaden mass on the horizon. It was evident that the good weather had ended and that we were going to run inside just in time to escape a storm.

CHAPTER IX

HABITS OF THE SEI WHALE

FOR many years the sei whale was supposed to be the young of either the blue or the finback whale, and it was not until 1828 that it was recognized by science as being a distinct species. The Norwegians gave the animal its name because it arrives upon the coast of Finmark with the *"seje,"* or

"For many years the sei whale was supposed to be the young of either the blue or the finback whale, and it was not until 1828 that it was recognized by science as being a distinct species."

black codfish (*Polachius virens*), but in Japan it is called *iwashi kujira* (sardine whale).

Until shore stations were erected in various parts of the world sei whales were supposed to be very rare and were known only from the North Atlantic

A sei whale fast to the ship. The shape of the spout is well shown.

Ocean, but within the last fifteen years they have been taken near South Africa, the Falkland and South Shetland Islands, and Japan, and have proved to be one of the most abundant of large cetaceans.

The sei whale has a roving disposition and wanders restlessly from one coast to another, sometimes journeying great distances and suddenly appearing in waters where it has never before been known. It

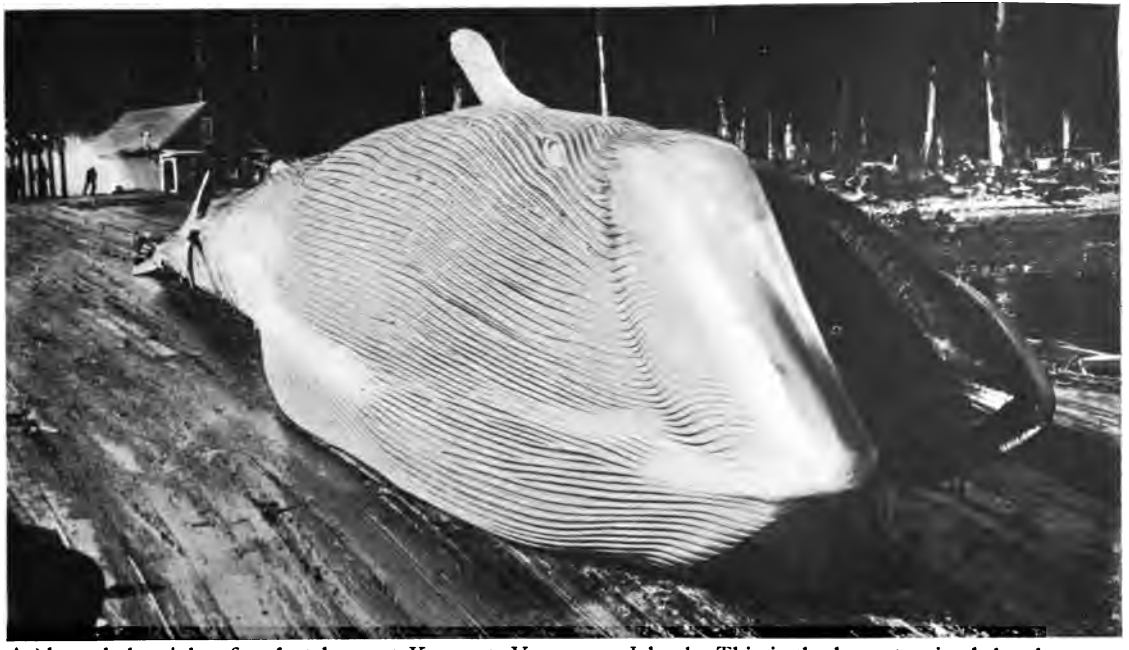
has more or less regular migrations and there is evidence that individuals travel from the Antarctic into the North Atlantic and Pacific Oceans.

Strangely enough a clew to their wanderings has been given by a parasite which lives upon the whale's body. This Copepod, known as *Penella antarctica,* produces a peculiar white or grayish oval scar two or three inches in length, which for many years was supposed to be a feature of the sei whale's coloration. I suspected at first sight that these spots were scars left by a parasite of some sort, but it was not until two years later that my suspicion was proved correct and the animal itself discovered.

It was doubly interesting to find that this parasite is an Antarctic species which has never been known from the North Atlantic or Pacific Ocean. On the second French Antarctic Expedition Dr. Liouville discovered that all the sei whales taken in the South Atlantic were bristling with these parasites but except in rare cases the whales of the north have none of them *in situ.* The parasites are short-lived and probably die or break off during the northward travels of their hosts, leaving only the scars behind.

It is not probable that *all* sei whales make this migration annually—in fact it is highly improbable that such is the case—but herds are apparently formed which visit certain localities every year, now and then being reinforced by individuals which have come either from the Antarctic into the north or vice versa.

The migration of the large Cetacea is a subject about which very little is known and of which but



A blue whale, eighty-five feet long, at Kyuquot, Vancouver Island. This is the largest animal that has ever lived upon the earth or in its waters, so far as is known at the present time.

few positive statements can be made. In the case of only one species, the California gray whale, can we tell exactly where, when, and how far the animals

"In the water the sei whale may be easily recognized at a considerable distance by the form of the spout and the high dorsal fin which is prominently displayed as the animal swims at the surface."

travel, for this coast-loving whale migrates as regularly as do birds and the paths of its wanderings are known.

In the water the sei whale may be easily recognized at a considerable distance by the form of the

spout and the high dorsal fin which is prominently displayed as the animal swims at the surface.

This species does not dive very deeply and when feeding its movements can usually be traced by the disturbed water, as well as by the clouds of birds hov-

"The sei whale has a roving disposition and wanders restlessly from one coast to another, sometimes . . . suddenly appearing in waters where it has never before been known."

ering about the tiny sea animals which come to the surface.

In Norway the sei whale feeds upon the small red shrimp (*Euphausia*) and an exceedingly minute crustacean known as "Aate" (*Calanus finmarchius*); in Japan only three or four individuals which I examined during 1910 had anything but shrimp in their

stomachs, although the natives say that sardines are often eaten, and call this species the sardine whale.

All the gunners assert that the sei whale can reach a greater speed in its first rush after being harpooned than any other large cetacean, and I have seen animals which were not killed at once dash off like a hooked bluefish. But the first wild rush is soon ended and the whale is generally easily killed because it does not have the strength and staying power of its larger relatives, the finback and the blue whale.

On land the African hunting leopard, or cheetah (*Acinomyx jubatus*), parallels the sei whale, and for a few hundred yards can probably distance any other animal, although it too soon tires if the chase is long.

CHAPTER X

A LONG BLUE WHALE CHASE

CAPTAIN FRED OLSEN had invited me to spend a week with him aboard the *Rekkusu Maru,* and for five days we had been at sea losing both coal and patience chasing finbacks with but one whale to our credit. The fifth evening, after a

"Suddenly a cloud of white vapor shot into our very faces and a great dripping body rounded out under the ship's bow. The click of the camera was followed by the deafening roar of the gun."

hard day's work with no results, the ship was headed for Kamaishi, a good harbor some seventy miles from Aikawa.

At 9:30 the *Rekkusu* was in quiet water well within the bay and when we came on deck for a look around we could see by their lights two whale ships riding smoothly at short anchor chains only a little distance away. One was *Daito No. 2,* Captain Larsen, with whom I had hunted humpback whales off the coast of Vancouver Island two years before when he had the *St. Lawrence;* the other, the *Airondo Maru,* Captain Reidar Jacobsen's ship. Both Olsen and myself were tired so we did not go aboard but turned in at ten o'clock and were soon asleep.

The next morning I was awakened by the alternate starting and stopping of the engines and knew that already a whale had been sighted. It was seven o'clock and dressing hurriedly I ran on deck to find the ship rolling about in a heavy sea and a cold rain falling. I got into a suit of oilskins and then climbed to the bridge. My greeting of *"O hayo"* (good morning) was answered by the man at the wheel, who said they were hunting a *shiro-nagasu* (blue whale), which had been found about six o'clock and had almost given a shot. Captain Olsen was at the gun and waved his hand in greeting just as we heard the metallic whistle of the spout on the starboard bow.

I got the camera ready for use, protecting it as much as possible with the flap of my oilskin jacket, but was rather dubious as to how successful the pictures would

be. The driving rain covered the lens with a film of water as soon as the coat was lifted, and I knew that trouble could be expected with the shutter when

"For ten minutes the silence continued, then the Captain said in a quiet voice: 'There he is, far away on the beam!'"

the dampness had penetrated to its curtain. The whale came up two or three times and through the field glasses I could see its diminutive dorsal fin and blue-gray back which, in the rain, appeared to be exactly the color of the water.

Twice a shot seemed imminent but each time the animal refused to take the last short dive which would have brought it within range. At 9 o'clock Captain Olsen ran to the cabin for a cup of coffee and to change his wet clothes, for he had neglected to put on oilskins before going on deck. He had only been below ten minutes when the whale appeared not far away and Olsen hurried forward, pulling on his coat as he ran. Again the whale rose, about thirty fathoms from the ship and just out of range.

Olsen called to me:

"Get ready; he'll come close next time."

Suddenly a cloud of white vapor shot into our very faces and a great dripping body rounded out under the ship's bow. The click of the camera was followed by the deafening roar of the gun; then there was a moment's stillness as the giant figure quivered, straightened out, righted itself, and with a crashing blow of the flukes swung about and dashed away, tearing through the water partly on the surface, partly below it.

The cry of *"Banzai!"* which rose from the sailors was drowned in the shrieking of the winch and the pounding of the line on the deck as fathom after fathom was dragged over the iron wheels.

Through the cloud of smoke I could see the Engineer putting all his strength upon the brake and heard him shout for water to wet the burning wood. One hundred, two hundred, three hundred fathoms were dragged out when suddenly the rush ceased and the ship lay still, quietly rolling in the swell. The whale

had sounded, and the rope hung straight down from the bow as rigid as a bar of steel.

Fifteen minutes we waited and there was no sign from below. Olsen began to get uneasy and to stamp upon the line, hoping to stir the great animal which was sulking on the bottom.

"I don't want him to die down there," he said, "for I'm afraid of this line. The starboard rope is all right but this one is weak. If he doesn't come topsides to blow so I can get in another harpoon, we may break the line in heaving him up. He's down a long way and the strain will be awful."

After twenty minutes the rope began slowly to come in, and I went forward with the Captain to the gun platform, waiting for the whale to spout. We saw it at last, but so far away that I thought it was a different animal. The engines had been stopped when the whale was down but now the ship began to move. Faster and faster the vessel tore through the water until Olsen ordered half speed astern.

The harpoon had struck the whale in a bad place, for with the iron imbedded between his massive shoulders he could pull with all his strength. For half an hour we were dragged through the water and again he sounded. This time he was down ten minutes and came to the surface with a rush which threw half his eighty feet of body into the air. Then he started off at a terrific pace. The Captain did not dare to check his dash and ordered another line to be spliced on when the men called up from below that the rope was almost gone. Three-quarters of a mile of line

was out before the animal finally slowed enough so that the winch could hold. Even then, with the engines at full speed astern, the ship was being dragged ahead at nearly six knots an hour.

Our catch next began a series of short dives, fol-

"I ran on deck just as the great brute rounded up right beside the bow and the gun flashed out in the darkness."

lowed by frantic rushes from side to side, which lasted two hours. Each time the animal went down the winch ground in a few fathoms of line, sometimes losing it and more on the next mad plunge, but slowly, surely, recovering it foot by foot.

At eleven o'clock the whale began to weaken. Every time he rose the stay at the surface was a little longer, his rushes became less violent, and the

winch swallowed more and more of the coveted line. With the powerful glasses I could see that at times the water about his back was tinged with red, and knew that the working of the hundred-pound harpoon between his shoulders was making an ugly wound and letting gallons of blood flow from his great veins.

Finally only one line besides the leader for the harpoon was out and I had already begun to work the camera whenever the whale rose to blow. The wind had nearly died but had left a tremendous swell, and the little ship was rolling and tossing like a thing possessed. Captain Olsen, against his better judgment, was drawing the whale in for a second shot when the line slacked away as the ship dropped into the hollow of a great swell, then tightened suddenly and parted with a crack like a pistol shot when she rose on the crest.

With an oath Olsen shouted for full speed, and fired as the great body disappeared beneath the surface. It was a long chance but he made it, and we gave a wild yell as the harpoon shot over the water in a wide semi-circle and dropped upon the whale's back. There was a sudden jerk, a muffled explosion, and the line slacked away again, leaving a great crimson patch staining the surface. The ship plunged forward through it and I saw the bits of torn and mangled flesh which told the story all too plainly—the bomb on the tip of the harpoon, as it exploded, had blown the iron out and the whale was free.

We lay to with the engine stopped to see what would happen next. Little was said; almost the only

sound was the retching and groaning of a pump when the ship keeled far over to starboard with the swell. For ten minutes the silence continued, then the Captain said in a quiet voice: "There he is, far away on the beam."

Instantly the "ting, ting" of the bell in the engine room sounded and a chase began which I shall long remember as showing what a great part persistency plays in whaling. All the rest of the afternoon the little ship hung to the whale's track, now getting almost close enough to shoot and again losing sight of the spout in the rain and fog. It was disagreeable enough for me on the bridge, where I could be partly protected from the cold rain by a canvas screen, but Captain Olsen never left the gun. At three o'clock a cup of tea was brought him and he drank it hastily, meanwhile cramming a few crackers into his pocket to be nibbled as opportunity offered.

The day wore on but the animal seemed to be stronger instead of weaker and at five o'clock I had given up hope that we would ever get another shot.

I had just started to leave the bridge to go below when the whale spouted about forty fathoms away and it seemed sure that he would rise again within range. The man in the barrel shouted: "There he comes!" and pointed to a spot just beside the port bow. Captain Olsen swung the gun until he was standing almost on the edge of the rope-pan in front. We could see the huge form just under the surface, but it turned down again, leaving a swirling green trail behind it.

"I'd have shot him in the tail if he had only come up," Captain Olsen shouted, "but we'll get him yet."

Shortly afterward the whale blew near us, dead ahead, and as he turned to go down a school of porpoises dashed along beside his back. When he rose

"The rope attached to the first harpoon floated backward in dangerous proximity to the propeller and it required some careful work to get the animal fast to the bow and the line safely out of the way."

a few seconds afterward the porpoises were leaping all about his head, and, bewildered, he did not know which way to turn. We almost reached him but he slid under the water just before the ship came up. For the next few minutes he was lost in the fog and gathering darkness and I shouted to Captain Olsen:

"You'll never get him. I'm going below."

"Well, I'll stand by until it is too dark to shoot," he answered. "I might get a chance yet."

I had hardly reached the cabin and begun pulling off my oilskins when the jerk of the engines told me they must again be close. I ran on deck just as the

Bringing the blue whale to the station. The carcass is almost as long as the ship.

great brute rounded up right beside the bow and the gun flashed out in the darkness. *"Shinda!"* yelled the sailors, and through the smoke cloud I could see the whale give a convulsive twist, roll on its side with the fin straight upward, and slowly sink.

Almost at once the winch began to take in the slack and haul the carcass to the surface. When it came alongside the rope attached to the first harpoon floated backward in dangerous proximity to the propeller, and it required some careful work to get the animal fast to the bow and the line safely out of the way.

We had a long tow to the station, for the chase had carried us nearly one hundred and thirty miles away, and not until the next afternoon did the sturdy little vessel sweep into the bay and deliver her whale to the station where in a very few hours its flesh would fill thousands of waiting cans and be sent to the markets throughout the Empire.

CHAPTER XI

THE LARGEST ANIMAL THAT EVER LIVED

THE blue whale is not only the largest animal that lives today upon the earth or in its waters, but, so far as is known, it is the largest animal that has ever lived. Even those giant extinct reptiles, the dinosaurs, which splashed along the borders of the inland seas of Wyoming and Montana 3,000,000 years ago, could not approach a blue whale either in length or weight.

In 1903, Dr. F. A. Lucas weighed in sections a blue whale taken at Newfoundland. The animal was 78 feet long and 35 feet around the shoulders; the head was 19 feet in length and the flukes 16 feet from tip to tip. The total weight was 63 tons; the flesh weighed 40 tons, the blubber 8 tons, the blood, viscera, and baleen 7 tons, and the bones 8 tons. So far as I am aware this is the only specimen which has ever been actually weighed.

Exaggerated accounts of the size of this species are current even in reputable books on natural history, but the largest specimen which has yet been actually measured and recorded is one 87 feet long, stranded a few years ago upon the coast of New Zealand; this animal must have weighed at least 75 tons. I have

A blue whale at Aikawa, Japan. "The largest specimen which has yet been actually measured and recorded is one 87 feet long, stranded a few years ago upon the coast of New Zealand; this animal must have weighed at least 75 tons."

measured two blue whales 85 feet long but individuals of this size are rare.

All the gunners who have hunted in the South Atlantic or Pacific tell remarkable tales of the enormous blue whales killed off Kerguelen and South Georgia Islands. I have no doubt that this species reaches

An eighty-two foot blue whale at Vancouver Island. The mouth is about nineteen feet in length, and the outer edges of the baleen plates are well shown.

90 or possibly 95 feet, but the stories of 115- and 120-foot whales are certainly myths. As Dr. Lucas aptly says, "All whales shrink under the tape measure."

Undoubtedly the principal reason why whales are able to attain such an enormous size is because their bodies are supported by the water in which they live.

A bird is limited to the weight which its wings can bear up in the air. A land animal, if it becomes too large, cannot hold its body off the ground or move about readily and is doomed to certain destruction. But a whale has to face none of these problems and can grow without restraint. The sperm and right whales float when killed, but the fin whales usually sink although the specific gravity of their bodies is but little more than that of water.

Because whales live in a supporting medium their young are of enormous size at birth, in some instances the calf being almost half the length of its mother. I once took from an 80-foot blue whale a 25-foot baby which weighed about 8 tons. The calf was just ready for birth and was fully formed, the whalebone being about three inches long.

At Aikawa a sperm whale 32 feet in length contained a fœtus 14 feet, 8 inches long, and in Alaska while a 65-foot finback whale was being drawn out of the water upon the slip she gave birth to a 22-foot baby, which, of course, was dead.

Not long ago I read an account of a happy event of this sort which was said to have occurred on the Labrador coast, where the baby whale flopped off into the water and swam away. This was, of course, not true, for the fœtus would die with its mother, but when such stories once find their way into print they are difficult to stop.

The wonderful strength of the blue whale is almost beyond belief, and I have listened to many stories from Norwegians which I would not dare repeat here al-

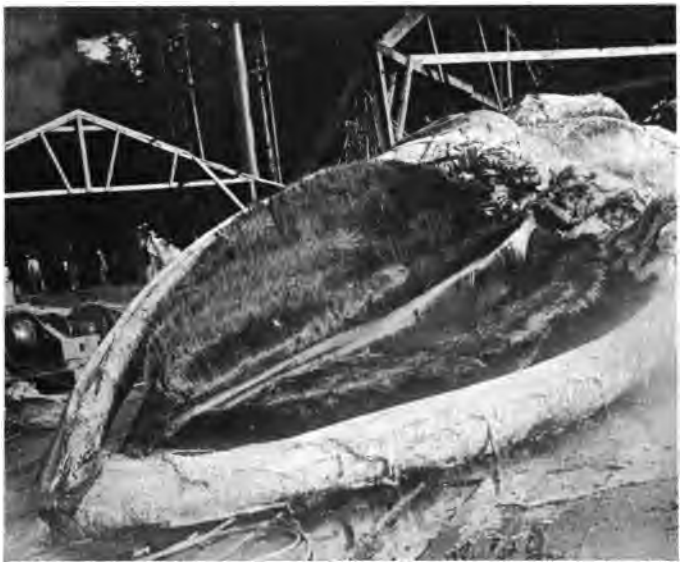
though personally I believe them to be true. J. G. Millais, Esq., has given an interesting account of a blue whale hunt, which I am quoting in full since it

The open mouth of a blue whale. Ten or twelve men could stand in the mouth, but the throat is only eight inches in diameter.

shows, in some degree, of what this magnificent animal is capable:

The most remarkable and protracted hunt on record after a Whale was experienced by the steamer *Puma* in 1903. The most exaggerated accounts of this appeared in the American and English papers, where the journalists went so far as to say that the Whale had towed the ship from Newfoundland to Labrador, and other wild statements. The following particulars were given by Hans Johanessen, mate of the *Puma,* so they are, at any rate, first hand.

The *Puma* spied and "struck" a large Blue Whale six miles from Placentia at nine o'clock in the morning. The animal immediately became "wild," and it was found impossible to get near enough to fire another harpoon into it. For the entire day it towed the steamer, with engines at half speed astern, at a rate of six knots. Toward evening a



The upper jaw of a blue whale, showing the mat of hairlike bristles on the inner edges of the baleen plates.

second rope was made fast to the stern of the vessel and attached to the first line, now "out" about one mile. The steamer then put on full speed ahead. This seemed to incense the Whale, which put forth all its strength and dragged the whole of the after part of the vessel under water, flooding the after cabin and part of the engine room. The stern rope was immediately cut with an ax and the danger averted.

All through the night the gallant Whale dragged the

steamer, with the dead-weight of two miles of rope and the engines going half-speed astern, and at 9 A. M. the following morning the monster seemed to be as lively and powerful as ever. At 10 A. M., however, its strength seemed to decrease, and at 11 it was wallowing on the surface, where at 12:30 it was finally lanced by the captain. This great fight occupied twenty-eight hours, the Whale having dragged the steamer a distance of thirty miles to Cape St. Mary.

One of the troubles of this form of whaling is the difficulty of avoiding fishing craft when the Whale is struck. In Shetland and Newfoundland captains are not allowed to fire at a Whale within one mile of boats or two miles of the coast, but these precautions are generally ignored. Captain Nilsen, when hunting in the *Cabot* in Hermitage Bay in 1903, struck a large bull which lay as if dead alongside the steamer. The crew were about to attach the tail to the bow-chains when the Whale suddenly recovered and started full speed for the coast, towing the steamer at ten knots.

After an hour it stopped and lay on the surface of the sea, when Captain Nilsen fired a second harpoon, which only had the effect of waking up the monster. It then went full speed for the fishing fleet, which was close at hand, dived under their nets, and did damage to the extent of a hundred dollars. After a further rush of five miles a third harpoon was fired, which killed the Whale right opposite the factory.[1]

My friend, Captain H. G. Melsom, tells me that while hunting off the coast of Siberia he struck a blue whale which ran out three thousand feet of line and, with engines at full speed astern, towed the ship for-

[1] "The Mammals of Great Britain and Ireland." By J. G. Millais. Longmans, Green, & Co., pp. 256-257.

ward for seven hours at no time at a less speed than eight knots. Some years before this in Norway he shot a blue whale at five P. M., which dragged the ship with engines at full speed astern until eleven P. M., when he slowed down to half speed; at one A. M. he changed to dead slow and he finally killed the whale at two o'clock in the morning.

CHAPTER XII

WHAT HAS BECOME OF THE WHALE'S LEGS

IF a whale is struck near the tail by the harpoon it is almost powerless to pull because the strain on the rope straightens out its body and the animal can swim only with difficulty. Practically all of the forward motion is developed by means of the flukes and the side fins are only used as balancing organs and in turning and rising to the surface. The flukes are not twisted in a rotary movement like the propeller of a ship, as is commonly believed, but wave straight up and down.

While hunting in Alaska I had an excellent opportunity to see the manner in which a whale swims. I had climbed to the barrel at the masthead while we were following an enormous humpback and as the water was like glass save for the long swell, I could see 15 or 20 feet beneath the surface.

Suddenly the dim outlines of the whale took shape in the green depths far below me but when near the surface the animal checked its upward rush, turned downward, and dove directly under the ship, rising a hundred fathoms away on the port beam. I could see every movement of the great body as clearly as though the whale had been suspended in mid-air. When the animal turned, the side fins were thrown

outward but were pressed close to the body as it swam under the ship.

A whale's flippers must not be compared with the fins of a fish, for in structure the two are quite unlike. The flippers of all cetaceans are merely the fore

Posterior view of a blue whale on the slip at Aikawa, Japan. The flukes have been cut off and the wide thin caudal portion of the body is well shown.

limbs of ordinary land mammals, which have become overlaid with blubber to form a paddle in adaptation to an aquatic life and have the bones, blood vessels, and nerves of the human arm. The flipper of the humpback whale has four greatly elongated fingers but in some other species there are five fingers as in the human hand.

Cetaceans also have rudiments of the hind limbs. These consist of the pelvis, which is fairly well devel-

oped, and small nodules of bone representing the femur and sometimes the tibia; the latter is cartilaginous except in rare cases. These rudiments are, of course, entirely concealed within the body and can only be found by carefully cutting away the flesh surrounding the sexual organs.

The flipper of a humpback whale. "The flippers of all cetaceans are merely the fore limbs of ordinary land mammals, which have become overlaid with blubber to form a paddle."

One of the most striking things about the blue whale, and indeed all its relatives, are the folds which extend longitudinally from the lower jaw backward over the throat, breast, and abdomen. In different species of whales the folds vary in number and width, the furrows between them being about an inch in depth and the skin capable of great extension.

The use of the folds has been a subject of disagreement among naturalists, but my own belief is

that they are an adaptation to increase the mouth capacity and to give greater power of expansion to the lungs.

The folds are not composed of flesh but entirely of blubber, the layer of fibrous fat which covers the bodies of all whales, porpoises, and dolphins and lies between the skin and the flesh. Since cetaceans are warm-blooded animals (fish and reptiles are cold-

After the humpback's flipper has been stripped of blubber. The forearm, wrist and fingers are shown. In this species the digits have been reduced to four and are greatly elongated.

blooded) it is necessary for them to have some protection from the cold. Hair is not sufficient for this purpose as in land mammals; consequently the layer of blubber, which acts as a non-conductor and prevents the heat of the animal's body from being absorbed by the water, has been developed. It is from this that the whale oil of commerce is boiled or tried out. The blubber may be easily peeled off the body in strips called "blanket pieces," which are cut into blocks and after being sliced are put into the trying-out kettles.

When one of these great pieces of blubber is being torn off a whale's body it sometimes gives way and springs back with tremendous force. At the Oshima station in Japan, my cook who had one day been pressed into service when several whales were waiting

The folds on the throat of a finback whale. Probably the folds are an adaptation to increase the mouth capacity and to give greater power of expansion to the lungs.

to be cut in was struck fairly upon the head by a blanket piece and instantly killed; his skull was crushed as though it had been paper and his neck, shoulder, and arm broken. At Aikawa a blubber strip gave way when half the carcass of a humpback was suspended in the air, letting the weight of some fifteen or twenty tons fall upon a cutter standing below;

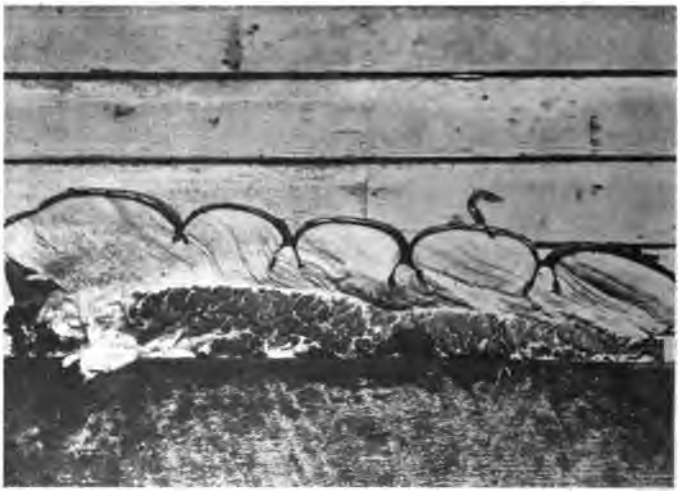
when taken from beneath the whale the poor fellow could hardly be recognized as a human being.

Kyuquot had trouble, also, when a blanket piece struck a flenser's knife, driving it into his side and injuring him badly. And yet it is surprising what tremendous strength and tenacity the fibrous blubber has. A few inches of it will resist the strain of several thousand pounds, and I have seen a whale drag a ship through the water for half an hour with only two harpoon prongs caught under the blubber of the back.

When a female whale is pregnant the blubber is much thicker and softer than at other times and yields a greater supply of oil; from other causes it may also be very thin, and become hard and dry. The blubber varies in color and may be light yellow, deep pink, or almost white. It is thinnest upon the sides, throat, and breast, and thickest on the "neck" just behind the blowholes, at the dorsal fin, and from that point along the ridge of the back, or "caudal peduncle," almost to the flukes. On the sides an average thickness in the fin whales is six inches, but just behind the dorsal fin it may reach twelve or fourteen inches.

Since cetaceans live in the water where they do not touch rough surfaces their skins are very soft and smooth; the skin is about half an inch thick and may be separated from the blubber only with difficulty. It is composed of one or more thin outer sheets (epidermis) which may be easily stripped off, leaving exposed the tender under layer (dermis). The skin

is perfectly dry and does not possess either the oil (sebaceous) or sweat (sudoriferous) glands usually present in the skins of land mammals. Because of the development of blubber, and the absence of functional hair, such glands are no longer necessary. The skins of some cetaceans, notably the white whale, or beluga,



A cross section of the folds on the breast of a humpback whale. The upper thin black margin is the skin, then comes the thick white blubber below which is the red flesh.

and the bottlenose porpoise are made into leather and furnish the "porpoise hide" of commerce, but that of other porpoises or whales has not been put to extensive commercial use.

I have often read of ships being followed for days by whales but have no first-hand information of such occurrences. Scammon, however, remarks that he

has "observed them following in a vessel's wake for several leagues," and gives an extract from the journal of Dr. J. D. B. Stillman of San Francisco, in 1850, concerning a blue whale, or "sulphur-bottom," as it is sometimes called, which followed the ship

The eye and ear of a blue whale. The eye is just above the corner of the mouth and the ear is the small spot about four feet behind it. The ear canal is just large enough to admit a small pencil, but because water is such a good medium for carrying sound, whales hear excellently.

Plymouth for twenty-four consecutive days. The account is so interesting that I quote it in full:

November 13th: We are witnesses of a very remarkable exhibition of the social disposition of the whale. A week ago to-day we passed several, and during the afternoon

it was discovered that one of them continued to follow us, and was becoming more familiar, keeping under the ship and only coming out to breathe. A great deal of uneasiness was felt, lest in his careless gambols he might unship our rudder, or do us some other damage.

It was said that bilge-water would drive him off, and the pumps were started, but to no purpose. At length more violent means were resorted to; volley after volley of rifle shots were fired into him, billets of wood, bottles, etc., were thrown upon his head with such force as to separate the integument; to all of which he paid not the slightest attention, and he still continued to swim under us, keeping our exact rate of speed, whether in calm or storm, and rising to blow almost into the cabin windows.

He seems determined to stay with us until he can find better company. His length is about eighty feet; his tail measures about twelve feet across; and in the calm, as we look down into the transparent water, we see him in all his huge proportions.

November 29th: The bark *Kirkwood* hove in sight, and bore down to speak to us. When off a mile or two to leeward, our whale left us and went to her, but returned soon after. He showed great restlessness last night; and today, whenever we stood off on the outward tack, he kept close below us, and rose just under our quarter, and most commonly to windward, to blow. But whenever we stood toward the land he invariably hung back and showed discontent. This afternoon he left us.

It is now twenty-four days since he attached himself to us, and during that time he has followed us as faithfully as a dog an emigrant's wagon. At first we abused him in every way that our ingenuity could devise to drive him off, lest he might do us some mischief; but save some scratches he received from our ship's coppering and numerous sloughing sores, caused by the balls that had been fired into him, no damage was received by either of us by his close companion-

ship, though our white paint was badly stained by the impurity of his breath.

We long since ceased our efforts to annoy him, and had become attached to him as to a dog. We had named him "Blowhard," and even fancied, as we called him, that he

The skull of an eighty-foot blue whale, the skeleton of which was sent to the American Museum of Natural History from Japan. When crated for shipment the skull had a space measurement of twenty-one tons.

came closer under our quarter, when I felt like patting his glabrous sides, and saying: "Good old fellow."

As the water grew shoaler he left us, with regret unfeigned on our part, and apparently so on his. This story of the whale is so remarkable, that were there not so many witnesses, I would not venture to tell it, lest I be accused of exaggeration. There were a number of experienced whalemen among our passengers, who said the animal was a "Sulphurbottom." [1]

[1] (*l. c.*, p. 71, note.)

CHAPTER XIII

THE GREYHOUND OF THE SEA

THE finback whale is the greyhound of the sea, and well deserves the name, for its beautiful, slender body is built like a racing yacht and the animal can surpass the speed of the fastest ocean steamship.

It is a hard whale to kill and trouble can always be expected if the iron strikes too far back. The first one I ever hunted gave us a four hours' fight, with two harpoons in its body, and furnished abundant proof of what a truly magnificent creature the finback is.

It was while I was with Captain Charles Grahame on the *Tyee* in Alaska. We had had an exciting experience with a humpback whale which rose under the ship (described in Chapter III), and after killing it had steamed toward several finbacks which were spouting far away near the coast. The huge brutes were feeding and lying on the surface rolling from side to side, thrusting their fins and flukes into the air. I could see, with the glass, that always when taking a mouthful of shrimps they turned on their sides, letting the great under jaws close over the upper, the water spurting out in streams from between the plates of baleen.

"The finback whale is the greyhound of the sea . . . for its beautiful slender body is built like a racing yacht and the animal can surpass the speed of the fastest ocean steamship."

As the vessel neared the whales the signal was sounded for half speed, and quietly she slid through the water toward two big finbacks which were leisurely swimming along close together. Intent on the feed which floated in patches at the surface and stained

"I was standing on the bridge with the camera focused and pressed the button as they rose to the surface."

the water a light pink, the whales paid not the slightest attention to the steamer which was creeping so slowly and quietly near them. They went down in front of the bow, just out of range, but without arching their backs, showing that the dive would be a short one; and so it proved, for they reappeared only ten fathoms away on the port bow.

I was standing on the bridge with the camera focused and pressed the button as they rose to the surface. An instant later came the crash of the harpoon-gun and the nearest whale, throwing its flukes and half its body out of the water, turned head down in a long dive.

"You got him," yelled the Captain, and it was evident that Sorenson had hit, for the heavy rope was running out at a tremendous rate. Fifty, seventy-five, one hundred fathoms were taken almost before we knew it. The man at the winch tried to check the hissing line but the brake could not hold. Half a mile of cable was gone before the rush ended and the Captain rang for half speed astern. When the whale felt the heavy drag of the vessel he stopped and sounded, sulked on the bottom for nearly half an hour, and finally reappeared in front of the boat, about three hundred fathoms away, blowing strongly.

The steamer was sent astern at half speed and the line held by the winch. The steady, relentless pull was too much for even his wonderful strength, and slowly we neared the whale. Back and forth he dived across our bows, tugging at the line and sometimes gaining a few fathoms from the grinding wheels. At last he rose directly in front of the ship and Sorenson sent a second harpoon crashing into his side.

Stung to renewed efforts by the biting steel, the whale dove at right angles to the vessel's course, keeling the boat far over to port. I was standing on the wing of the bridge waiting to get a picture when the Captain shouted:

"An instant later came the crash of the harpoon gun and the nearest whale, throwing its flukes and half its body out of the water, turned head down in a long dive." The cloud of smoke, the rope and wads from the gun are shown; the harpoon has buried itself in the whale.

"Quick! Give me a hand, sir, or he'll cut the line on our bow!"

I dropped my camera and jumped to the wheel which the Captain was whirling frantically to port. Bracing ourselves, we held it hard over and the vessel responded almost instantly, relieving the strain

The finback whale reaches a length of about seventy-five feet. The left side of the throat is dark slate while the right side is pure white.

on the rope, which was sawing back and forth across the bow.

The whale now began a series of dashes and deep sounds which dragged the lines from the winch in spite of both brakes and kept the little vessel dodging

from side to side to avoid his blind rushes. For an hour and a half the magnificent animal carried on the fight, although slowly becoming weaker and weaker from exhaustion and the loss of blood. Finally he lay almost motionless on the surface about fifty fathoms away, blowing frequently, great patches of blood staining the foam about his beautiful gray body.

After waiting fifteen or twenty minutes the Captain ordered a boat lowered and Sorenson, with two sailors, rowed out to finish the whale with the long killing lance. I had climbed to the barrel at the masthead, glass and camera slung at my side, and was watching the little pram as it neared the dying finback. After circling around the animal the boat was slowly backed toward it, the Gunner standing erect in the stern with lance ready, awaiting his opportunity. Suddenly he leaned forward and thrust the steel with all his strength deep into the whale's side. At the same instant the boat was pulled away, and the beast sank in a mass of red foam. A few seconds later he reappeared, sending from the blowhole a thin stream of blood which floated off on the wind.

Again and again Sorenson lanced him, each time remaining a little longer and jabbing the lance deeper into his body. At last the gallant animal threw his fin into the air, rolled on his side, and sank, the taut lines proclaiming that the fight was ended.

I had hardly climbed down the rope ladder to the deck when Sorenson's face, flecked with blood and streaming with perspiration, appeared over the side. Laying the long lance on deck, he said:

"I had climbed to the barrel at the masthead . . . and was watching the little pram as it neared the dying finback. After circling around the animal the boat was slowly backed toward it, the Gunner standing erect in the stern with lance ready, awaiting his opportunity. Suddenly he leaned forward and thrust the steel with all his strength deep into the whale's side."

"That was the toughest whale I ever killed. Not many fight like that."

I was surprised to find, on looking at my watch, that it was already nine o'clock, the struggle having lasted nearly four hours. The excitement of the day

Marked with a flag and left to float until the end of the day's hunt.

had been intense and I was too tired to remain on deck while the big finback was made fast to the bow, and the floating whale picked up. Saying good night to Captain Grahame, I went below, climbed into the narrow bunk in the little cabin, and was asleep even before the noise above had ceased.

The night was anything but a dreamless one to me

and in the morning when I heard the sudden roar of the harpoon-gun and felt the vessel tremble under the shock I started up hardly knowing whether I was awake or not. But the rattling winch and the thumping of the line made certain that it was no dream.

The whale is made fast to the bow by a heavy chain and the ship starts on the long tow to the station.

Catching up camera and plate holders, I scrambled through the companionway, forgetting in my haste that I was without coat or shoes. Sure enough, we were fast to a humpback which was visible about one hundred fathoms away, swimming high out of water and blowing frequently. When I reached the bridge, the Mate, who was at the wheel, said:

"Yes, he came up suddenly right under the bow; but you'll have plenty of chances today if the wind keeps down. Look at those birds; there must be lots of feed."

I was shivering in the raw morning air and ran back to the cabin to get into a coat and shoes. I found Captain Grahame about to come on deck. He laughed when he saw my scanty dress, saying:

"You camera fellows would rather run the risk of catching your death of cold than miss a picture, wouldn't you!"

I assured him, through chattering teeth, that pneumonia had no terrors when whales were in sight, but made haste to pull on my heavy varsity sweater and high boots. Sorenson was leisurely reloading the gun when I went forward and the humpback, blowing every few seconds, could be seen far ahead.

When the bomb had been filled with powder and the fuse string adjusted, the Engineer started the winch and the line was reeled slowly in. The animal resisted in a half-hearted way at first, but soon gave up and was drawn close to the ship. I stood just back of the harpoon platform, with camera focused, waiting to see Sorenson whirl the gun about for the second shot, but instead of doing so he called for the lance and made ready to kill the whale from the bow.

Leaning far out over the side, the Gunner watched his opportunity and plunged the slender rod of steel deep into the lungs, stabbing again and again with all his strength. The animal gave a hoarse, coughing blow and tried to dive, the blood welling in great red

bubbles from his spout holes. It was a pitiful sight as the poor brute fought gamely for life with the odds all against him, and I turned away with a sigh of relief when he rolled over and sank to the bottom.

While the whale was being lifted to the surface and inflated, I breakfasted with the Captain in the little galley, doing justice to Billy's excellent porridge and coffee. In half an hour we went to the bridge to relieve the mate, and found the vessel headed to the eastward where a number of spouts were just visible far over toward the shore. With the glasses we could see that they were finbacks, and the thin columns of vapor shooting up every few seconds indicated that the animals must be feeding.

The success of the morning and the prospects of a good day's hunting had put every man on board in the best of humor. Captain Grahame paced back and forth beside me, telling of his experiences while cruising in Australian waters and describing wild nights at sea as only a deep-water sailor can, meanwhile watching the whales ahead.

In half an hour we were near them, and the vessel was swung toward two finbacks which were separated from the rest of the school and were swimming side by side. As they dived we could see that one was very small, a calf; the larger was probably its mother.

The engines were at dead slow and the little steamer slipped quietly through the water in a long circle about the "slick" where the whales went down. In a low voice Captain Grahame called to the Gunner, telling him to shoot the big one first, and at almost the same

"Sorenson hesitated, swung the gun a little to one side and fired. The great cloud of smoke blown backward in our faces shut out the water ahead, but in a few moments it lifted and I was surprised to see the whale lying on its side at the surface, apparently dead."

instant I saw the telltale patch of smooth water just in front of the bow.

I shouted to Sorenson and jumped to the starboard side where, by leaning far out, I could see the swirling green spot in the mirror of my camera. With a rush

Bringing in a finback. The harpoon rope is being cut from the iron in the whale.

the mother whale came to the surface, followed a second later by her calf. Sorenson hesitated, swung the gun a little to one side and fired. The great cloud of smoke blown backward in our faces shut out the water ahead, but in a few moments it lifted and I was surprised to see the whale lying on its side at the surface, apparently dead. It was the first time I had

ever seen a finback float, although I had been told that occasionally they did not sink when killed.

While the animal was being secured and the air pump started, I climbed to the barrel to watch the movements of the calf. The little fellow refused to

A finback lying in the water at Aikawa just before it is "cut in."

leave his dead mother and circled around and around the boat within easy gunshot. Although he was swimming low in the water, showing only a small part of his back above the surface, I exposed a plate each time he came near, until the stock of negatives had been exhausted.

In a short time Sorenson had the gun reloaded and

stood ready for a shot at the calf when next he came within range. From the masthead I could look far down into the clear water and once saw the little finback rising almost under the vessel. I shouted a warning to the men below and as he reached the surface the

Drawing up a finback at Aikawa, Japan.

harpoon crashed into his side, going almost through him.

When I had descended to the deck and stood beside Captain Grahame on the bridge his face was beaming with smiles. Pulling out his watch, he said:

"It's only ten o'clock and I think we will tow these three in. The rest of the bunch are scattered now, but maybe they will come together this afternoon,

and we can get back in time for the evening hunting."

In half an hour all the whales had been made fast to the bow and the engines were throbbing monotonously as the sturdy little vessel plowed her way through the water toward the station, leaving a long black trail across the blue sky behind.

CHAPTER XIV

SHIPS ATTACKED BY WHALES

AFTER I left Alaska the Tyee Company put into service a wooden whale ship called the *Sorenson,* which in 1910 was sunk by a finback. The animal had been struck by one iron and, suddenly going into its death flurry, began charging madly in every direction.

The long slender body of a finback lying on its side; the outer edges of the whalebone plates in the mouth are well shown.

In one of its wild dashes the sixty-ton whale, coming at a speed of probably twenty-five knots per hour, drove straight into the ship, crushing her side like an eggshell and tearing her almost apart. The vessel filled so rapidly that the crew were hardly able to get a small boat over before she went down. Later the men were all rescued.

J. G. Millais, Esq., says of the finback:

> Space will not allow me to give any of the numerous stories of the exciting hunts to which one listens in the galley and the cabin of the Atlantic Finwhalers, but they prove that the chase of this great Whale calls for the sternest courage and readiest resource.
>
> To stand up in a tiny "pram" amidst a whirl of waters and lance a fighting Finback is no child's play, and requires that six-o'clock-in-the-morning pluck that the Norsemen possess in a high degree. Many accidents have occurred to the boat crews when engaged in "lancing," and one or two to the steamers themselves.
>
> The whaler *Gracia*, belonging to Vadso, was sunk by a Finner in 1894 in the Varanger Fjord. In 1896 the *Jarfjord* was sunk in ten minutes by one of these Whales charging it, when about sixty miles north of the North Cape. A heavy sea was running at the time, and the crew crowded into two small prams, which would probably have been overwhelmed had not Captain Castberg, hunting in another steamer, come to their rescue.[1]

Without doubt practically all ships which have been injured or sunk by whales have been struck by accident. Just before a whale dies it goes into what is

[1] "The Mammals of Great Britain and Ireland." By J. G. Millais. Longmans, Green, & Co., p. 271.

called the death flurry and dashes wildly about in every direction. If a ship or boat happens to be near it stands an excellent chance of being rammed, for the animal is utterly blind in its rushes.

The sperm is an exception to the rule of purely accidental attacks, however, for there are many well authenticated instances of whales of this species, while

The spout of a finback whale. The column of vapor rises to a height of about twenty feet.

only slightly wounded and not in the death flurry, deliberately sinking boats and even three-hundred- or four-hundred-ton vessels.

Almost every deep-sea whaleman has stories to tell of "rogue" sperms, which are usually old bulls that have sought a solitary life either from choice or ostracism from the main herd. Such animals are often vi-

cious and sometimes turn furiously upon the boats when struck with an iron.

The "devilfish," or California gray whale, had a bad reputation among the whalers of fifty years ago, for when attacked upon its breeding grounds it is said to have fought fiercely for the protection of its young. Under such circumstances its actions would undoubtedly be very different from what I have observed when gray whales were killed near Korea, where we had no more trouble than with other species.

At sea it is often impossible to distinguish the blue and finback whales by the way they blow. The columns of vapor are much alike under ordinary circumstances, except that the spout of the blue whale is usually somewhat higher than is the finback's. However, much depends upon the size of the animal, since a large finback will often blow as strongly as a small blue whale. But if not far away the blue whale may be easily known by the light gray-blue color of its body, for it contrasts strongly with the dark slate upper parts of the finback which, when dripping with water, often look almost purplish. The Norwegian name *blahval* was given to the greatest of all living creatures because of the distinctly bluish color of its body. The Newfoundland and American whalemen call the animal "sulphur-bottom," a most inappropriate name, for there is no suggestion of yellow on its body. The Japanese know it as *shiro-nagasu* (the white finback).

The diving movements of the two species are also similar except that in rare instances a blue whale will

draw out its flukes when sounding, while a finback never does. Each one ascends obliquely, delivering the spout as soon as its head appears at the surface, and each slowly revolves, lifting its body high out of the water as it goes down. But the finback is more regu-

A finback whale "sounding" or taking the "big dive."

lar in its movements when traveling than is its larger relative. Then it will swim as straight as an arrow, not varying a quarter of a point from its course, and blow at regular intervals.

The blue whale, even when not frightened, spouts very irregularly. Under ordinary circumstances it will blow from eight to fifteen times at a rising and always with a tremendous noise. The sound is a me-

tallic, whistling roar which can be heard at a distance of three or four miles if there is a fog or the sea is calm. I always have a feeling of admiration when watching either a blue or finback whale, for the magnificent brutes move in a slow and dignified way as

When sounding the finback sinks lower and lower until the dorsal fin disappears; this is the last part of the body to leave the surface. This species never draws out the flukes as do the humpback, sperm and right whales.

though conscious that they are the largest and most imposing animals of ancient or modern times.

As a supplement to my own experiences while hunting finbacks in Alaska, I have taken the liberty of quoting a portion of J. G. Millais' description of killing a whale of this species off the Shetland coast, for it shows most admirably what real excitement one can have even in modern whaling:

At 7:30 it was bitterly cold, when Captain Stokken again stood beside the gun, and we were in full pursuit of a large female Finback that seemed tamer than the rest. Eventually, in its final "roll," the Whale raised itself about ten yards from the gun, and the whaler tipping the muzzle downwards, fired and struck the quarry under the backbone.

At first the Finback was rather quiet, and then it began to run, the strong line rushing out at a speed of about fifteen knots. When some two miles of rope had gone over the bow I turned to Captain Stokken and said, "How much line have you got?"

"About three mile," was the curt reply.

"But when that three mile goes, what then?"

"Oh, well," was the imperturbable answer, "then I check line, and we see which is strongest, Whale or rope. Perhaps harpoon draws out."

In the course of a minute the Captain gave the order to check the line. The strain now became terrific, the two-inch rope straining and groaning as if it would burst. At the same moment the little steamer leaped forward and raced over the seas at about twelve miles an hour. There was a feeling of intense exhilaration as we rushed northwards, the spray flying from our bows as the ship leaped from crest to crest in the heavy swell.

I have enjoyed the rushes of gallant thirty- and even forty-pound salmon in heavy water on the Tay—the supreme moments in an angler's life—but that was mere child's play to the intense excitement which we experienced during the next three hours. To be in tow of a wild Whale is something to remember to one's dying day. You feel that you are alive and that you are there with the sport of kings. No wonder the Norwegians are full of life; the men, from the captain to the cook, run to their several tasks with eyes and hearts aflame. This is a calling which will stir the blood of the dullest clod, and to men who are one and all

the finest seamen in the world is the very life and essence of the Viking nature.

Three hours of this fierce race went on, and the Whale seemed as if it would take us to Iceland. The gallant Finback was as fresh as ever when the captain gave the order, "Quarter speed astern." With a tremendous strain on the rope and the churning of the backward driving screw our speed was at once reduced to ten knots. It was marvelous, the strength of that animal. The minutes and even the

A finback taking an "intermediate" or "surface" dive.

hours fled by, still the great Cetacean held on its northward course without a check.

Three hours passed; then came the order "Half speed astern," and we were down to six knots, the vessel and the Whale still fighting the battle for the mastery.

In another hour the Whale showed visible signs of weakening when "Full speed astern" brought matters to a standstill. The machinery of man and the natural strength of the beast still worried on for another hour, and then we saw the steamer moving backwards, the Whale was done, and could pull no more.[1]

[1] "The Mammals of Great Britain and Ireland." By J. G. Millais. Longmans, Green, & Co., pp. 272-273.

Although the blue and finback whales of the Atlantic and Pacific have been given different names, yet there is little doubt but that each is represented in all oceans by a single cosmopolitan species.

Apparently no definite barriers exist to curtail the wanderings of the fin whales (*Balænopterinæ*), for they seem to be indifferent alike to tropic or Arctic temperatures and travel where they will. Probably the presence or absence of the little shrimp which forms their food is one of the greatest determining factors of their movements.

In most oceans whales live under very similar conditions and naturalists are gradually coming to recognize that the laws of geographical separation which hold universally good for land mammals are not equally true in the case of cetaceans. In other words, if any group of land mammals is separated from others of its kind by impassable barriers such as water, mountains, deserts, etc., it will gradually develop changes in structure or external appearance due to differences of climate, food, or other conditions of environment.

But this is not true of the fin whales for the conditions under which they live in the North Pacific are very similar to those in the North Atlantic; consequently, even if the animals of the two oceans never mingled, they could probably continue to reproduce themselves without material change for an almost indefinite period. But there is strong evidence to show that all the fin whales do travel from one ocean to another by way of Capes Horn and Good

Hope and, since the tropic waters of the Equator are not an effective barrier, wander from the borders of the Antarctic far up into the North Pacific and Atlantic, or vice versa.

The sperm whale is also a cosmopolitan wanderer, but the right whales apparently do not cross the

The upper jaw of a finback whale, showing the bristles on the inner edges of the baleen plates.

Equator which, as Lieutenant Maury remarks, acts to them like a "belt of fire." The bowhead is found only in the Arctic regions.

Strangely enough, if whales are driven away from inland waters they seldom return, and others will not take the places of those which have been killed. This

has been demonstrated on the American west coast to the considerable financial loss of both the Tyee Company of Alaska and the (former) Pacific Whaling Company of Victoria, British Columbia.

The Tyee Company erected a station on the southern end of Admiralty Island, sixty miles from the open sea, and although when operations were first begun finback and humpback whales were there in hundreds, they were soon all killed and the vessels had to hunt "outside."

The Pacific Whaling Company spent many thousands of dollars building a station at Nannaimo, on the east coast of Vancouver Island, expecting to capture a sufficient number of whales in the bay and straits to supply their factory. Their hopes were not realized, however, for after two or three seasons' work there were no more whales to kill and the station had to be moved near the open sea.

It seems to be true that in all parts of the world the blue and humpback whales first leave the feeding grounds and that the finback and sei whales will remain longer than any other, even when persistently hunted.

CHAPTER XV

REDISCOVERING A SUPPOSEDLY EXTINCT WHALE

HALF a century ago, on the Pacific coast of America, each year a whale appeared as regularly as the season itself; first in December, traveling steadily southward to the warm California lagoons, and again in May heading northward for the ice-filled waters of the Arctic Ocean. It came close inshore, nosing about among the tentacle-like ropes of kelp and sometimes wallowing in the surf which broke among the rocks.

The Siwash Indians along the coast awaited the coming of this whale with the same eagerness with which the Egyptians hail the rising of the Nile, for to them it meant a time of feasting and of "potlatch." In their frail dug-out canoes they hung about the kelp fields, sending harpoon after harpoon into its great gray body as the animal rose to breathe, until it finally turned belly up and sank. It was a matter of only a day or so then before the barnacle-studded carcass, distended with the gases of decomposition, floated to the surface and was towed to the beach by the watchful natives.

As the years went by, however, the whales became more wary, fewer and fewer coming into the kelp

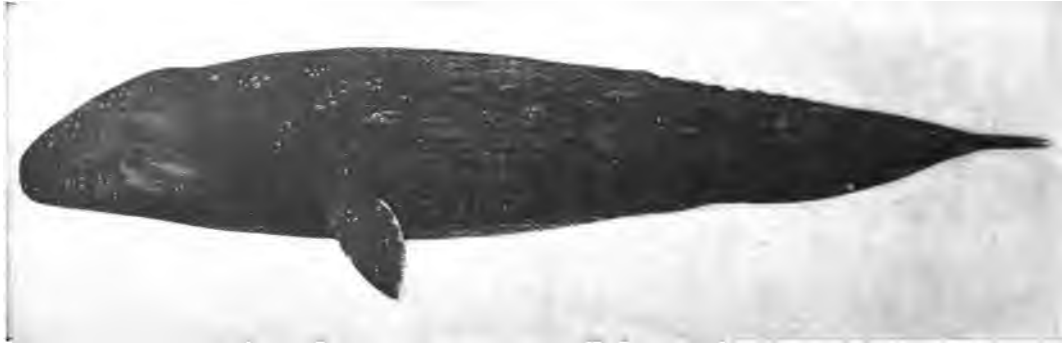
fields, until finally they ceased altogether and passed up and down the coast on their annual migrations far out at sea where they were safe from the deadly harpoons of the hunters.

But the whales, for all their astuteness, were not free from persecution. During the winter, when they came into the shallow water of the California lagoons to bring forth their young, the American whaling ships came also, and the animals, held by mother love, were killed by hundreds.

However, they were not always slaughtered without making a fight to save their babies, and because they frequently wrecked the boats and killed the crews they gained the title of "devilfish," and as such are generally known throughout the Pacific rather than by the more formal name of California gray whale, which was bestowed upon them in 1868 by Professor Cope.

The American fishery did not last long for continual slaughter on their breeding grounds soon so depleted the numbers of the gray whales that the hunt was no longer profitable, and the shore stations which had been established at various points along the coast finally ceased operations altogether. For over twenty years the species had been lost to science and naturalists believed it to be extinct.

In 1910, while in Japan, I learned from the whaling company of the existence of an animal known as the *koku kujira,* or "devilfish," which formed the basis of their winter fishery upon the southeastern coast of Korea.



The side view of a model of a gray whale in the American Museum of Natural History prepared under the direction of the author from studies made in Korea.

A ventral view of the gray whale model. Note the three furrows in the throat.

The descriptions indicated that the *koku kujira* would prove to be none other than the lost California gray whale, and I determined to investigate it at the earliest opportunity. Consequently during the winter of 1911-12, I returned to the Orient and spent the months of January and February at the station of

The whaling station at Ulsan, Korea.

the Toyo Hogei Kaisha at Ulsan, a small village on the southeastern coast of Korea.

I shall never forget my introduction to Korea by way of the Japan Sea. We left Hakata on the night of January 4, in a little transport chartered by the whaling company to carry meat and blubber to the markets. The vessel had a tiny, very dirty cabin aft,

just large enough for three persons, into which five Japanese and myself were packed. It was bitterly cold outside and such a tremendous sea was running that the cabin deck was flooded every few moments, keeping us wet to the skin. After a twenty-three-

"At the port bow hung the dark flukes of a whale, the sight of which made me breathe hard with excitement."

hour trip, late in the afternoon we ran up the bay which cuts deeply into the peninsula of Korea forty miles north of Fusan.

As we pulled up to the long wharf at the whaling station I could see numbers of white-robed figures running about like goats on the hills behind the houses or standing in limp, silent groups gazing in my direc-

tion. The audience, however, regarded me with no greater curiosity than I looked at them, for the Korean is at all times peculiar in appearance and especially so when in full dress.

He wears a long white coat with flaring skirts, enormous baggy trousers gathered at the ankle with a green or purple band, and atop his head is perched a ridiculous little hat made of horsehair with a sugar-loaf crown and a straight brim. The hat must be tied under his chin to keep it in place, but at times it slips over one ear and gives its wearer a singular resemblance to "Happy Hooligan." His hair is gathered in a knot on the top of his head, and the few straggling wisps of mustache or beard which he manages to grow are as carefully tended as a rare flower. He is never seen without his long-stemmed pipe, and a tobacco pouch always dangles at his belt.

The natives of Ulsan appeared to derive never ending amusement from me and my work. They were living an utterly lazy, aimless life and although they never seemed to know where the next meal was coming from they looked content and well enough fed. Numbers were always hanging about the station waiting to pick up any scraps of whale meat left by the cutters, and all day long the children, each with a little basket, poked about among the cracks in the wharf, now and then gleaning a handful of flesh and blubber, which would help to keep life within their bodies.

After I had secured the skeleton of a gray whale and had piled the bones, partially cleaned, in the station yard, the Koreans descended upon them like a

flock of vultures. With a knife or a bit of stone they scraped each bone, cleaning it of every ounce of meat. At first this seemed to me a splendid arrangement, but suddenly I discovered that some of the smaller bones themselves were disappearing and realized that my

Cutting in a gray whale. The head is lying on the wharf and two Koreans are standing beside it. They wear long white coats, enormous baggy trousers and a horsehair hat.

skeleton was slowly but surely being boiled for soup.

It did not take long to issue an edict against all Koreans in reference to my whale, but the matter did not end there. The pile of toothsome bones was too great a temptation and whenever I happened to be out of sight some white-gowned native was sure to steal up and leave with a bone under his coat.

I finally discovered a very effective, and I think highly original, way to stop the stealing. In my equipment there was a 22-caliber rifle and several hundred B. B. caps, the bullets from which would just about penetrate the thick, wadded trousers of a Korean.

"When the winch began slowly to lift the huge black body out of the water, a very short examination told me that the *koku kujira* really was the long-lost gray whale."

I made a hole in the *shojo,* the paper screen of the Japanese house where I was living, and sat down to watch. In a short time a Korean stole up to the pile of bones and bent over to pick out one which he could carry. I drew a fine bead on the lower portion of his anatomy and when the rifle cracked the native made a

jump which would have brought him fame and fortune could it have been duplicated at the New York Hippodrome. It is hardly necessary to say that he dropped the bone. In a very short time every Korean in the village knew that a visit to that skeleton generally entailed difficulty in sitting down for several days afterward and the whale was left unmolested.

On the day of my arrival at Ulsan the four whaling ships which hunted from the station were all lying in the harbor, for the gale had made cruising outside impossible. As soon as we landed I met my friend, Captain H. G. Melsom of the *S. S. Main,* one of the best gunners who has ever hunted in the East. Captain Melsom was the first man to learn how to take the devilfish in Korean waters, because for many years the habit of the animals of keeping close inshore among the rocks baffled the whalers. He learned how to trick the clever whales and hang about just outside the breakers ready for a shot when they rose to blow. From Captain Melsom I learned much of the devilfish lore and many evenings on his ship, the *Main,* did I listen to his stories of whales and their ways.

I shall never forget the intense interest with which I waited for my first sight of a gray whale. On the next day after my arrival at Ulsan I had started across the bay in a sampan to have a look at the village with Mr. Matsumoto, the station paymaster. We had hardly left the shore, when the siren whistle of a whale ship sounded far down the bay and soon the vessel swept around the point into view. At the port bow hung the dark flukes of a whale, the

sight of which made me breathe hard with excitement, for one of two things must happen—either I was to find that here was an entirely new species, or else was to rediscover one which had been lost to science for thirty years. Either prospect was alluring enough and as the vessel slowly swung in toward the wharf and a pair of great flukes, the like of which I had never seen before, waved in front of me, I realized that here at last was what I had come half around the world to see.

When the winch began slowly to lift the huge black body out of the water, a very short examination told me that the *koku kujira* really was the long-lost gray whale and not a species new to science. But it was not the gray whale of Scammon's description, for this white-circled, gray-washed body was very little like the figure he had published in his book, "The Marine Mammalia."

Many new things were learned during the succeeding months of studying this strange animal, but chief among them were the facts that the gray whale differs so strongly from all others that it must be placed in a family of its own; also that it is the most primitive of all existing large cetaceans and is virtually a *living fossil.*

CHAPTER XVI

HOW KILLERS TEAR OUT A GRAY WHALE'S TONGUE

THE gray whales, as well as other large cetaceans, have only two enemies—man and one of their own kind, the orca or killer whale. Although twice the size of the killers and correspondingly strong, when one of the orcas appears the devilfish become terrified and either wildly dash for shore or turn belly up at the surface, with fins outspread, paralyzed by fright.

A few days after my arrival at Ulsan, three gray whales were brought to the station, one of which had half the tongue torn away; teeth marks clearly showed in the remaining portion and Captain Hurum, who had killed the animals, told me that it was the work of killers.

There were seven gray whales in the school, he said, and shortly after he began to hunt them fifteen killers appeared. The whales became terrified at once and he had no difficulty in killing three of the seven. When the orcas gathered the whales turned belly up and made not the slightest attempt to get away. A killer would put its snout against the closed lips of the devilfish and endeavor to force the mouth open and its own head inside. This extraordinary method of attack was corroborated by Captain Johnson, who

had been hunting the same school of gray whales, and, moreover, by all the whalemen at the station, who had witnessed it upon many other occasions.

Of thirty-five gray whales which I examined espe-

Cutting through the body of a gray whale. The thick layer of blubber surrounding the red meat is well shown.

cially, seven had the tongues eaten to a greater or less extent and one had several large, semicircular bites in the left lower lip. The killers do not confine their attention entirely to the tongue for almost every whale which was brought in had the tips and posterior edges

of the fins and flukes more or less torn; in several specimens fresh teeth marks were plainly visible where the fin had been shredded as the whale drew it out of the orca's mouth.

Although none of the gray whales exhibited teeth marks on other parts of the body, undoubtedly some of them are killed by the orcas. A female killer which was brought in had several pieces of flesh in its stomach, besides a strip of whalebone three inches long. I could not positively identify the latter but believe it to have been from a small devilfish. A male killer was taken at the same time by Captain Hurum, who told me that in the animal's death flurry it had thrown up two great chunks of flesh.

Captain Melsom brought a gray whale to the station one day and I found that the tongue was almost gone. He said he had passed a school of killers in the morning and later, after steaming about fifteen miles, had killed the devilfish. A short time afterward, a long distance away, he saw the fins of a school of killers which were coming at full speed straight for the ship. They circled about the vessel and one of them forced open the mouth of the dead whale to get at the tongue. Captain Melsom fired at the killer with his Krag rifle and when struck the animal lashed out with its flukes, smashing the ship's rail, and then disappeared.

As soon as orcas appear, if the gray whales are not paralyzed by fright, they head for shore and slide in as close as possible to the beach where sometimes the killers will not follow them. The devilfish will

actually get into such shallow water as to roll in the wash and will even try to hide behind rocks. The orcas are not afraid of ships and will not leave the whales they are chasing when the vessels arrive, thus giving much assistance to the human hunters.

The posterior part of a gray whale. Note the scalloped dorsal ridge of the peduncle and the white markings along the sides.

Captain Johnson, of the *Rex Maru,* brought to the station at Ulsan a gray whale which had been shot in the breast between the fins. He had first seen killers circling about the whale which was lying at the surface, belly up, with the fins outspread. The animal was absolutely paralyzed by fright. The vessel steamed up at half speed and Johnson shot at once, the

iron striking the whale squarely between the flippers.

The gray whales live in such constant terror that when porpoises are playing about a single animal, as frequently happens, it will sometimes become terrified and dash madly for the shore, thinking that the killers have appeared.

I have never personally witnessed it, but the gunners tell me that a pod of gray whales can be stampeded much like a herd of cattle. If three or four ships are near each other when a school of devilfish are found, they draw together, each vessel going at full speed, while the sailors beat tin pans and make as much noise as possible. The whales at once dive, but as soon as they rise to spout the vessels rush at them again. The devilfish go down once more but do not stay under long, ascending at shorter and shorter intervals until finally they are plowing along at the surface.

The animals are "scared up," as the gunners say, and become terrified to such a degree that everything is forgotten except the desire to get away—and even the means of doing that. It is not always possible to stampede a herd, for often the whales will disappear at the first sound and not rise again until a long distance away. If killers are about, it is very easy for the ships to stampede a herd of gray whales.

Even if the devilfish do exhibit considerable stupidity when danger from orcas threatens, at other times they are the cleverest and most tricky of all large whales. One day Captain Melsom, on the *S. S. Main*, was hunting a gray whale in a perfectly smooth sea.

The animal had been down for fifteen minutes when suddenly a slight sound was heard near the ship and a thin cloud of vapor was seen floating upward from a patch of ripples which might have been made by a duck leaving the surface. The whale had exposed only the blowholes, spouted, refilled the lungs, and again sunk, doing it almost noiselessly. The gunners assert that this is quite a usual occurrence when a single gray whale is being hunted.

One of the most interesting things in the life history of the devilfish is the annual migration which occurs as regularly as the seasons. In no other large cetacean is there anything like the migrating instinct which carries the gray whales from the icy waters of the north three thousand miles to the south to seek the warm lagoons of California and Korea in which to raise their young.

On both sides of the Pacific the migrations take place at almost the same time. Along the Korean coast near the end of November single pregnant females appear, traveling steadily southward; a little later both males and females are seen; and finally only males bring up the rear, all having passed by January 25th.

When going south almost every female is found to be carrying young nearly ready for birth, and all are hurrying straight ahead as though anxious to arrive at the breeding grounds as soon as possible. The devilfish again pass Ulsan, Korea, on the northward trip, about the middle of March, and by May 15 have disappeared.

A comparison of these observations and those made by Scammon on the California coast show that the migration periods of both herds correspond closely and that the breeding grounds are in very nearly the same latitude.

The flukes of a gray whale. The edge of the flukes of this species is very thick, but in most whales it is exceedingly thin.

As yet it is impossible to state whether or not the Korea or California herds mingle in the north during the summer. Information gathered from the whalers tends to show that a large part of the former school summers in the Okhotsk Sea, and a large part of the latter in the Bering Sea and farther north. Individuals of the two herds may mingle and interbreed dur-

ing their sojourn in the north, but it is probable that whales which have been born near either the Korea or California coasts will find mates among the members of their own herd during the southern migration, and return annually to their birthplace. It is quite conceivable that the case of the gray whale may be like that of the fur seal, where it has been shown conclusively that members of the American and Japanese herds do not mingle in the north although separated by comparatively few miles of water.

Because of its regular migrations, the period of gestation of this species can be more nearly determined than that of any other large whale, and is about one year. Mating appears to take place in the south during December or early January, and the calf is ready for delivery at the same time the following winter; probably calves are born but once in two years. The length of the gray whale calf at birth is between twelve and seventeen feet and undoubtedly its size is much more than doubled during the first year after birth.

The devilfish is a shore-loving species and on its annual migrations always prefers to cruise along close to the beach. When unmolested it swims about four or five miles an hour and cannot exceed nine miles even when badly frightened and doing its best to get away.

At times the whales will go in so close to the shore that they are actually rolling in the surf, and seem to enjoy being pounded by the breakers. Scammon has

observed the same habit in the California specimens and says:

About the shoals at the mouth of one of the lagoons, in 1860, we saw large numbers of the monsters. It was at the low stage of the tide, and the shoal places were plainly

A strip of blubber from the back of a gray whale with the short flipper at the end of it.

marked by the constantly foaming breakers. To our surprise we saw many of the whales going through the surf where the depth of water was barely sufficient to float them. We could discern in many places, by the white sand that came to the surface, that they must be near or touching the bottom.

One in particular lay for half an hour in the breakers,

playing, as seals often do in a heavy surf; turning from side to side with half extended fins, and moved apparently by the ground-swell which was breaking; at times making a playful spring with its bending flukes, throwing its body clear of the water, coming down with a heavy splash, then making two or three spouts, and again settling under water; perhaps the next moment its head would appear, and with the heavy swell the animal would roll over in a listless manner, to all appearances enjoying the sport intensely. We passed close to this sportive animal, and had only thirteen feet of water.[1]

Often, when being hunted, the Korean whales would swim into water so shallow that the ships could not follow, and remain there until the men had given up the chase.

[1] (*l. c.*, p. 24.)

CHAPTER XVII

SOME HABITS OF THE GRAY WHALE

ALTHOUGH the stomachs of a great number of gray whales were carefully examined, I could never discover what constitutes their food, and no one else seems to have had better success. In every case the stomach was more or less filled with dark green water in which the only solid materials were bits of kelp, a little seaweed, and small masses of light green gelatinous material.

The stomachs of two individuals contained a number of waterworn pebbles and several small pieces of what appeared to be finely shredded flesh still connected by its fibers; this certainly was not fish. It is probable that the kelp, seaweed, and pebbles had been taken in with other material and were not swallowed intentionally.

All the gunners assert that when the gray whales appear at Ulsan on their migrations they are invariably traveling straight ahead and apparently not stopping to feed. This information, combined with the fact that little except water could be found in the stomachs, lends strong support to the theory that when upon their annual migrations the devilfish do not feed at all, and during the winter draw for nourishment upon the fat of their thick blubber. This is true

of the fur seal during the breeding season, and of other water mammals. When the male fur seals arrive upon the "rookeries" at the Pribilof Islands to await the coming of the females, their bodies are covered with layer upon layer of fat. During the following four months the bulls do not leave the land and neither eat, drink nor sleep while they guard their harems, subsisting upon the fat which has been stored up on their bodies. When the animals leave in the fall to spend the winter at sea, they have become so thin through their self-enforced fasting that they are mere skeletons of their former well-fed selves.

Scammon says that in the spring the blubber of the devilfish is dry and yields but comparatively little oil, as would be the case if the animals had fasted during the winter. I have no personal information as to this because in Korea these whales are not killed on their northward migrations. So many other and more valuable species can be taken during the spring that the devilfish are allowed to depart unmolested. If they do feed while on their migrations, the food in their stomachs would certainly have been discovered when the animals were cut in at the stations.

The male devilfish at all times shows strong affection for the female, and when a school of males, led by one or two females, is found, if one of the latter is wounded, often the bulls refuse to leave until the cow is dead.

Captain Melsom tells me that while hunting a pair of devilfish near Ulsan he shot the female, and the male would not leave his dead consort, keeping close

alongside and pushing his head over her body. Later he struck the male with a harpoon, but did not get fast, and even then it returned and was finally killed.

Scammon says that when attacked in the lagoons with their young the devilfish would turn furiously

Captain Melsom about to lance a gray whale from the pram.

upon the boats, and that almost every day injuries to the crews were reported. He gives an interesting account of two gray whales which, in February, 1856, were found aground in Magdalena Bay:

> Each had a calf playing about, there being sufficient depth for the young ones, while the mothers were lying hard on the bottom. When attacked, the smaller of the two old whales lay motionless, and the boat approached near enough to "set" the hand lance into her "life," dispatching the animal at a single dart. The other, when approached, would

raise her head and flukes above the water, supporting herself on a small portion of the belly, turning easily and heading toward the boat, which made it very difficult to capture her.

It appears to be their habit to get into the shallowest inland waters when their cubs are young. For this reason the whaling ships anchor at a considerable distance from where the crews go to hunt the animals, and several vessels are often in the same lagoon.[1]

The whalemen in Korea, where the hunting is done from small steamships by the Norwegian method, do not regard the animals as especially dangerous. They seldom lance one from the pram, as is frequently done with other whales, because the devilfish seem to be very sensitive to pain and as soon as the iron penetrates the body the animal will raise itself in the water, throwing its head from side to side and sometimes lashing about with its flukes and flippers.

Probably if the gray whales were hunted on their breeding grounds about the southern end of Korea, they would be found to be dangerous even to the vessels themselves, but I doubt if more so than other species under similar conditions.

Most whales are subject to diseases of various kinds and the devilfish is no exception. One specimen was brought to the station at Ulsan with all the flesh on the left side of the head badly decomposed and in some places entirely gone, leaving the bone exposed; what remained hung in a soft, green evil-smelling mass. The whale had evidently suffered considerably

[1] (*l. c.*, p. 25.)

from the disease, for it was very thin and the blubber was dry.

A second specimen had a large swelling on the ventral ridge of the peduncle, which, upon being opened, proved to be a large capsular tumor about one foot in

After the death stroke. The lance has penetrated the lungs and the whale is spouting blood.

depth and of a like diameter. The skin upon the snout of a third individual was drawn into small circular patches, leaving large sections of the blubber exposed.

The entire body of the devilfish is thickly infested with "whale lice" and barnacles. The former resembles a diminutive crab and by means of the sharp claws

on its feet fastens itself firmly on the soft skin of the whale. Wherever there is an injury or abrasion of any sort, quantities of these parasites cluster and breed.

On the snout and top of the head the skin is usually roughened, or cornified, much like the "bonnet" of the right whale, this being caused by the attacks of the whale lice. If one of these parasites is placed upon the hand it begins slowly to raise the body upon the front legs, driving its claws into the flesh, and in a short time will be firmly fastened and can only be removed with difficulty. The whale lice are crustaceans and have been named *Cyamus scammoni* after Captain Charles M. Scammon, who first discovered them upon the gray whales of California.

Besides whale lice the devilfish are the hosts of hard, shell-like barnacles known as *Cryptolepas rhachianectei.* These imbed themselves deeply on all parts of the body and sometimes are found in large clusters. Whenever a barnacle becomes detached a circular, grayish pit remains; this becomes white as the wound heals, and the scar is exactly like that produced on the humpback by the barnacle *Coronula diadema.* Without doubt these parasites cause the whale a great deal of annoyance and the animals probably rub themselves against rocks in endeavors to scrape them off.

The hairs on the devilfish are longer and are distributed more uniformly over the entire head than in the case of any other whale. This is an exceedingly interesting and important fact and, together with many other anatomical characters, indicates that the gray

whale is a very primitive species which is more like its ancient, fossil ancestors than any other existing large cetacean.

The presence of hairs upon whales and dolphins is evidence that when the animals lived upon the earth, millions of years ago, they must have been entirely covered with hair as are ordinary land mammals. The hair of most whales is confined to the snout and chin but in the devilfish it is distributed in irregular rows over the top and sides of the head.

The hair on cetaceans is in a degenerate condition and does not possess at the base a gland (sebaceous) for the secretion of oily matter to supply it with nourishment and lubrication as in land mammals. It seems probable that the loss of hair in cetaceans is largely due to their aquatic life, because the blubber performs the function of hair in keeping the animals warm and an outer covering is no longer needed; also most land mammals need hair to protect their tender skins from bruises and abrasions but for a whale this is unnecessary.

The manatee, or sea cow, an entirely aquatic mammal, has lost nearly all hair, and in the walrus it has become very much reduced; the latter animal spends almost all its time in the water, coming out but comparatively seldom to sleep upon the smooth ice; and in addition to the blubber it has developed an exceedingly tough skin. It is true that seals all possess blubber, and some an additional coat of thick soft fur, but they are not as yet exclusively aquatic; although much of their life is spent in the water, they still come

upon the land for extended periods during the breeding season and need hair for protection from the rough rocks upon which they rest, rather than for warmth.

The blubber of the devilfish is thick and fat and varies in color from red to flesh-pink. Because of this difference the Japanese recognize two kinds of gray whale—the *aosaki* (red blubber) and the *shirosaki* (white blubber), but this is merely an individual difference and certainly is not sufficient ground for specific distinction.

The Japanese consider the meat and blubber of the devilfish to be of poorer quality for eating than that of any other baleen whale. In the winter, during December and January when the price is at the highest, the blubber sells for about 4 *sen* (2 cents) per pound and the red meat at 10 *sen* (5 cents).

CHAPTER XVIII

THE WOLF OF THE SEA

ALTHOUGH the killer whale has no great commercial value, it is often brought in at the shore stations and figures so prominently in all deep-sea life that to omit it from any book on whaling would be a grave error.

The killer is the wolf of the sea and like the land wolves hunts in packs of twenty or more individuals which will attack and devour almost anything that swims. Every whaleman has stories to tell of the strength and ferocity of these sea terrors, but I think that the incident witnessed by Captain Robert F. Scott and published in the journal of his last ill-fated expedition is one of the most remarkable experiences of which I have ever known. It is so interesting that I have quoted it in full:

Thursday, January.—All hands were up at 5 this morning and at work at 6. Words cannot express the splendid way in which everyone works and gradually the work gets organized. I was a little late on the scene this morning, and thereby witnessed a most extraordinary scene.

Some 6 or 7 killer whales, old and young, were skirting the fast floe edge ahead of the ship; they seemed excited and dived rapidly, almost touching the floe. As we watched, they suddenly appeared astern, raising their snouts out of

"The killer is the wolf of the sea and like the land wolves hunts in packs of twenty or more individuals which will attack and devour almost anything that swims." This specimen, taken at Oshima, Japan, was twenty-six feet in length, and its skeleton was sent to the American Museum of Natural History.

water. I had heard weird stories of these beasts, but had never associated serious danger with them. Close to the water's edge lay the wire and stern rope of the ship, and our two Esquimaux dogs were tethered to this.

I did not think of connecting the movements of the whales with this fact, and seeing them so close I shouted to Ponting,

A posterior view of a killer showing the high dorsal fin. In the male the dorsal is over six feet in height but in the female it is only four feet.

who was standing abreast of the ship. He seized the camera and ran toward the floe edge to get a close picture of the beasts, which had momentarily disappeared. The next moment the whole floe under him and the dogs heaved up and split into fragments. One could hear the "booming" noise as the whales rose under the ice and struck it with their backs.

Whale after whale rose under the ice, setting it rocking

fiercely; luckily Ponting kept his feet and was able to fly to security. By an extraordinary chance also, the splits had been made around and between the dogs, so that neither of them fell into the water. Then it was clear that the whales shared our astonishment, for one after another their huge hideous heads shot vertically into the air through the cracks which they had made. As they reared them to a height of 6 or 8 feet it was possible to see their tawny head markings, their small glistening eyes, and their terrible array of teeth—by far the largest and most terrifying in the world. There cannot be a doubt that they looked up to see what had happened to Ponting and the dogs.

The latter were horribly frightened and strained to their chains whining; the head of one killer must certainly have been within 5 feet of one of the dogs.

After this, whether they thought the game insignificant, or whether they missed Ponting is uncertain, but the terrifying creatures passed on to other hunting grounds, and we were able to rescue the dogs, and, what was even more important, our petrol—5 or 6 tons of which was waiting on a piece of ice which was not split away from the main mass.

Of course, we have known well that killer whales continually skirt the edge of the floes and that they would undoubtedly snap up any one who was unfortunate enough to fall into the water; but the facts that they could display such deliberate cunning, that they were able to break ice of such thickness (at least 2½ feet), and that they could act in unison, were a revelation to us. It is clear that they are endowed with singular intelligence, and in future we shall treat that intelligence with every respect.[1]

Dr. Charles H. Townsend, Director of the New

[1] "Scott's Last Expedition." Arranged by Leonard Huxley. New York, 1913, Vol. I, pp. 65-66.

York Aquarium, tells of an interesting experience on the Pribilof Islands, which illustrates the terror in which the killers are held by other water mammals. He was collecting a number of the great Steller's sea lions for the Smithsonian Institution and was shooting the animals, which were on land, with a repeating rifle.

The sea lions began rushing toward the water in terror when suddenly the high dorsal fin of a killer whale appeared a few fathoms offshore. The sea lions stopped short and could not be forced into the water, preferring to face the unknown danger of the rifle rather than certain death in the jaws of an enemy which from earliest babyhood they had been taught to fear.

The killer belongs to the dolphin family, of which it is the largest member, reaching a length of from twenty to thirty feet. These animals are found in almost every ocean of the world and, although several species have been described, probably there is but one, *Orca orca.* The dorsal fin of the male is six feet high while that of the female is but three and one-half or four feet, and this has led to the naming of specimens which have proved to be only the male and female of the same species.

Killers will apparently eat anything that swims and fish, birds, seals, walrus, whales, and porpoises are all equally acceptable. Their capacity is almost unbelievable, and there is a record of thirteen porpoises and fourteen seals being taken from the stomach of a twenty-one-foot specimen.

Dr. Wilson speaks of killers in the Antarctic as follows:

Of the whales, the most prominent of all are the Killers, or Orca whales, which scour the seas and the pack-ice in hundreds to the terror of seals and penguins. The Killer is a powerful piebald whale of some fifteen feet in length. It hunts in packs of a dozen, or a score, or sometimes many scores. No sooner does the ice break up than the Killers appear in the newly formed leads of water, and the penguins show well that they appreciate the fact by their unwillingness to be driven off the floes.

From the middle of September to the end of March these whales were in McMurdo Strait, and the scars that they leave on the seals, more particularly on the Crab-eating seal of the pack-ice, afford abundant testimony to their vicious habits. Not one in five of the pack-ice seals is free from the marks of the Killer's teeth, and even the Sea Leopard, which is the most powerful seal of the Antarctic, has been found with fearful lacerations.

Only the Weddell Seal is more or less secure, because it avoids the open sea. Living, as it does, quite close inshore, breeding in bights and bays on fast ice some ten or twenty miles from the open water, it thus avoids the attacks of the Killer to a large extent.[1]

In Japan killers are abundant, especially near Korea, and I have seen numbers of the animals in the Bering Sea and along the coast of Vancouver Island. The Japanese call the killer *"takamatsu"* and in various parts of America it is known as the orca, thresher, or grampus. The two latter terms are especially confusing and inappropriate, for the name thresher properly

[1] "The Voyage of the *Discovery*," 1905, App., p. 470.

belongs to a shark and grampus to a species of porpoise (*Grampus griseus*).

The trident-shaped area of white, the white spots behind the eyes, and the enormous dorsal fin are very conspicuous on the black body, and the animal may be recognized at a long distance; fœtal specimens have orange-buff where the adult is white.

The killer can swim at a tremendous speed and because of the nature of its food the sounds and bays along the coast which swarm with every variety of marine life are more frequently its feeding grounds than the open sea.

Scammon says that the killer is a menace to even the full-grown walrus, especially when pups are with their parents. He states that sometimes the young walrus will mount upon its mother's back to avoid the killer and that then "the rapacious orca quickly dives, and, coming up under the parent animal, with a spiteful thud throws the young one from the dam's back into the water, when in a twinkling it is seized, and, with one crush, devoured by its adversary." [1]

The killer's habit of forcing open a whale's mouth and eating the tongue from the living animal, is an extraordinary method of attack which has long been recorded by the whalemen who hunted the Arctic bowhead. I must confess, however, that I had always been skeptical as to the accuracy of this report until my own experiences with the gray whales in Korea, where its truth was clearly demonstrated.

[1] (*l. c.*, p. 92.)

Another story which is undoubtedly purely mythical, although it has astonishingly wide credence, is that of "the swordfish and the thresher." It is said that a swordfish with a killer will attack a large whale, prodding the animal from below with its "sword" and

An anterior view of a killer. The heavy teeth and the white spot just behind the eye are well shown.

preventing it from diving, while the killer tears out the tongue.

I have personally interviewed a number of men who were reported to have witnessed such a combat, but have never yet found one who had seen a swordfish, or had any evidence of one being there, although the killer could easily be seen. They usually defend

their story by saying that a swordfish must have been below, otherwise the whale would have sounded. Undoubtedly what prevents the whale from diving is the fact that it becomes paralyzed with fright and so utterly confused that it is unable to escape.

An orca probably could not kill a large whale alone, but single individuals undoubtedly cause all the fin whales great annoyance by biting off the tips of their flukes and flippers; at least two-thirds of the whales brought to the stations had the flukes or flippers injured. I have a photograph of a young finback whale with the flipper torn and mangled and plainly showing a killer's teeth marks.

The sperm whale is probably the only marine animal which is more than a match for a herd of killers. The enormous lower jaw of a sperm whale presents an array of teeth even more formidable than those of the orca, and I greatly doubt if the killer could succeed in terrifying this whale; it is significant that the flukes and flippers of sperms are practically always free from injuries.

Like other members of the dolphin family, the killer has twelve teeth in both jaws and they may be readily distinguished from those of the sperm whale by their smaller size and flatter basal portion.

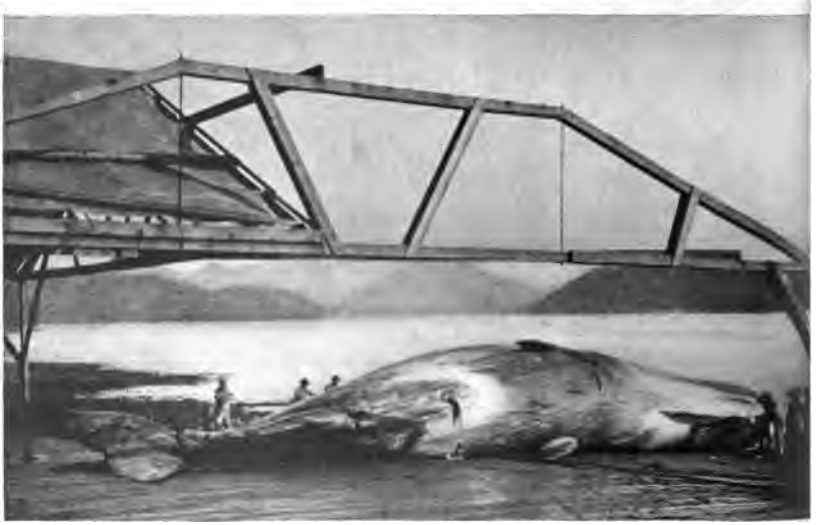
CHAPTER XIX

A STRANGE GIANT OF THE OCEAN

OF all the strange animals which live in the sea the sperm whale is certainly one of the most extraordinary; whenever I look at one I feel like saying with the country boy who had just seen his first camel:

"There ain't no such thing, b'gosh."

Its head, which occupies one-third of the entire body,



A sperm whale lying on the slip at Kyuquot, Vancouver Island. Note the slender lower jaw and the small side fins.

is rectangular in shape, and contains an immense tank filled with liquid oil known as "spermaceti." It is only necessary to cut an opening in the "case," as this portion of the head is called, and with a bucket dip out ten or fifteen barrels of oil.

Spermaceti congeals slightly when cooled and in appearance is much like soft white paraffin. Beneath the oil-case is a great mass of cellular tissue, called the "junk," which also contains spermaceti although not in a liquid condition. Spermaceti is used almost entirely for lubricating fine pieces of machinery and its quality is very much superior to the oil obtained from the blubber.

The use to the whale of the oil-case is largely a matter of conjecture. My own belief is that it acts as a great reservoir and that the animal draws upon it for nourishment during periods of food scarcity. Bears, seals, and other animals store up on their bodies great quantities of fat which enable them to live without food during hibernation, or the breeding period, and the sperm whale is possibly a similar case; some specimens are killed which are "dry," and have practically no oil in either the blubber or head.

Spermaceti should not be confused with "ambergris," a substance of great value in the manufacture of perfumes, which is obtained *only* from the sperm whale. Ambergris is due to a pathological condition of the intestines and is never found in healthy whales. It is impossible to tell just how the substance is formed, but the fact that it often contains cuttlefish beaks leads to the supposition that it is in some way connected with

the squid and cuttlefish upon which the sperm whale feeds.

If but a small amount of ambergris is produced it will often pass off with the excreta and, since it is very light, may be found floating in the water, but the en-

Stripping the blubber from the head of a sperm whale. Immediately beneath the blubber of this portion is the oil-case. The blowhole may be seen at the end of the snout.

tire intestines of dead whales have been known to be clogged with the substance. It is exceedingly valuable, the black ambergris being worth at the present time $12.50 an ounce, and the gray, which is of superior quality, $20. As much as $60,000 worth has been taken from the intestines of a single whale.

It is not itself used as an odor but as a *fixative* in

perfumes; that is, to make the fragrance last. Many substitutes for ambergris have been adopted in commercial work, but as yet none has been found which is as effective as the original substance.

For hundreds of years ambergris has been known and used in various ways. It was formerly supposed to have wonderful medicinal qualities (which, however, are largely mythical) and in Asia was employed as a spice in cooking. The Turks have long considered it of the greatest value, and pilgrims who traveled to Mecca used to bring it as an offering. Ambergris has a peculiar and not disagreeable odor which, when once identified, will not easily be forgotten; after touching it traces of the smell will still remain even though the hands have received several washings.

During the last eight years at least fifty persons have brought to my office for identification almost as many different substances which they have found floating or washed up on the seacoast, and which they devoutly prayed might prove to be ambergris. One man brought as a sample a large piece of tallow from a barrelful which he had collected at considerable trouble and expense; another had a portion of a jellyfish, and a third carefully treasured a mass of dirty soap. But as yet no one has brought "the real thing." Ambergris is soluble in alcohol and this is a good first test for those to whom the substance is unknown.

The sperm is by far the largest member of the toothed whale family and has from eighteen to twenty-five massive teeth on each side of the lower jaw; these fit into sockets in the upper jaw and assist in

holding the whale's food. Upper teeth are also present but are in a rudimentary condition and, except in rare cases, do not protrude into the sockets; undoubtedly in ancient times the upper teeth were as well developed as the lower but since they have not been

"The sperm . . . has from eighteen to twenty-five massive teeth on each side of the lower jaw; these fit into sockets in the upper jaw and assist in holding the whale's food."

needed they have gradually atrophied and almost disappeared. Like the teeth of other animals, those of the sperm whale are hollow in the basal half of their length for the reception of nerves; in young whales this nerve cavity is wide and deep but it almost closes with increasing age.

Quite frequently the lower jaw of an immature animal will be injured and as the whale grows its jaw becomes twisted like an enormous corkscrew. The widespreading posterior part of the jaw is called the

Cutting away the "junk" from the "case" of a sperm whale. The junk is a mass of cellular tissue which also contains spermaceti.

"panbone" and from it the sailors make walking sticks, pie-markers, hairpins, and carvings which are often beautifully executed. "Scrimshawing," or drawing upon whale's teeth, also helps to while away many weary hours when the ship lies still in a tropic calm.

The sperm whale is a lover of warm currents which

favor the giant squid and cuttlefish on which it lives, and although it has been taken as far north as the Aleutian Islands, Alaska, even there it is in the comparatively warm waters of the Japanese stream; it has also been captured in the sub-Antarctic near the Falkland Islands.

The squid reach a length of twenty feet or more and the whale sometimes has terrific battles with its huge prey, the tentacles of which, armed with deadly suckers, tear long gashes in the skin of the head and snout, leaving white scars crisscrossed in every direction. In Japan I took several enormous spiny lobsters from the stomach of a sperm whale, as well as the remains of a shark and seventy or eighty yellow parrot-like beaks of the cuttlefish.

Unlike the whalebone whales, of which the opposite is true, the male sperm is very much larger than the female, and an old bull will sometimes reach a length of seventy feet and weigh eighty or ninety tons. Such an animal is a truly colossal creature. The head of a sixty-foot sperm, which was killed by Captain Fred Olsen in Japan especially for the American Museum, was almost twenty feet in length, and the skull, when crated, had a space measurement of twenty-six tons; it was so large that it would barely pass through the main hatch of the steamship which carried it to New York.

The sperm has only a single S-shaped blowhole situated almost at the end of the snout on the left side, and its spout, which is like that of no other whale, may be easily recognized even at a considerable dis-

tance; the low, bushy, vapor column is directed diagonally forward and upward, and the animal blows much oftener and more regularly than other large cetaceans. A sperm may spout thirty or forty times when not

An anterior view of a young male sperm whale. The head occupies one-third the entire length of the animal and the lower jaw is much shorter than the upper.

disturbed, generally lying still but occasionally swimming slowly during the entire breathing period.

When a bull is wallowing at the surface, the "hump" (corresponding to the dorsal fin of the fin whales) is first seen, and at regular intervals, as the spout is ejected, the nose appears some forty feet ahead. The length of time he stays at the surface, the number of

spouts, and the interval between them are all very regular and thus the hunters, after a particular whale has been observed for a few minutes, know exactly when the animal will again appear and how long it will remain visible.

After its blowing has been finished, the head gradually sinks, the back and "small" are curved upward, the flukes are lifted slowly high into the air, and the whale goes straight down.

During the "big dive" the animal remains below from fifteen to forty minutes and when reappearing, if not disturbed, swims tranquilly along just below the surface at a rate of about three or four miles an hour. His body is then horizontal, with the hump projecting above the water.

When frightened and speeding, a totally different attitude is assumed and the great flukes are moved violently up and down; at each downward stroke the head sinks eight or ten feet below the surface but rises with the upward motion, presenting only the cutwater-like lower portion. The upstroke of the tail appears to be the more powerful of the two, and at the same time the broad upper half of the head is lifted above the surface. A speed of ten or twelve miles an hour can be reached in this way, which the whalers describe as "going head out."

The sperm is very playful and like the humpback frequently "breaches," or throws itself out of water, shooting into the air at an angle of about 45 degrees and falling back upon its side. It sometimes lobtails also, pounding the water into spray with its flukes.

When a sperm is harpooned with a hand iron it often rolls over and over on the surface, winding the line about its body and causing the hunters a deal of trouble.

Along the Japanese coast during July the sperm

The tongue of a sperm whale; it is strikingly different from the enormous flabby tongue of the whalebone whales.

whales sometimes appear in enormous herds of four hundred or more; the great animals will lie at the surface spouting continually and the sea for half a mile will be alive with whales.

When the steam whalers find a school of this sort, signals are set to bring in all the ships which may be near, and there is excitement enough for everyone.

The guns bang as often as they can be loaded and the whales made fast, and the number killed is merely a question of how many harpoons each ship carries, or the hours of daylight left when the herd is found.

The school will usually move very slowly, blowing

The head of the sixty-foot sperm whale, the skeleton of which was sent to the American Museum of Natural History, from Japan. The "case" yielded 20 barrels of spermaceti.

and wallowing along at the surface, and the animals in the center are heedless of the slaughter on the outskirts of the herd. At times, however, the whales will stampede at the first gun, and it then becomes a stern chase, which is often a long one, before a ship can get fast.

At Aikawa, one day, a whale ship with a Japanese gunner raised a herd of sperms a long way from the village. The man allowed his greed to get the better of his judgment and killed *ten* whales. He made them all fast to the ship, which could barely move her load through the water, and it was not until three days later that she arrived at the station. The whales had all "blasted," or decomposed, and were not as valuable commercially as a single fresh one would have been.

The meat of this species is so dark and full of oil that it is of but little use as food. Nevertheless, during the summer it is sold to the native coal miners of Japan who live in such extreme poverty that they are glad to get even such meat at two or three *sen* per pound.

I shall not attempt to chronicle here the numerous authentic instances of ships or boats which have been destroyed and sunk by sperm whales, for they are the common property of every book on deep-sea whaling. They leave no doubt that these animals often turn the tables on their hunters and attack with savage ferocity and dire results.

Apparently the sperm is the only whale which will deliberately turn upon its pursuers when not in its death flurry. Not only is its tail used with terrible effectiveness in sweeping the surface of the water and delivering smashing blows, but boats are often crushed like kindling wood between its horrible jaws.

It would be interesting to know how long sperm whales live. The bull which was killed in Japan for the American Museum showed unmistakable evidences

of great age. Its head was covered with white criss-crossed scars, bearing testimony of terrific battles with giant squids in the ocean depths, and the teeth of its lower jaw were worn almost flat, projecting only an inch or two above the gum. The bones of its skeleton were hard and rough, being covered with tubercles and bony growths.

A posterior view of the head of the Museum's sperm whale. The thick covering of blubber which encircles the head is well shown.

All this indicated that the animal had lived for many years, but how many it is impossible to tell. The condition of the skeleton shows whether a whale is old or young, for in immature animals the bones of the skull are separated (i. e., the sutures are open), the plates on the end of the vertebræ (epiphyses) are free, and all the bones are soft and spongy. Even

though the whale may have reached adult size, which it usually does in three or four years, the evidences of youth are still present in the skeleton.

Reasoning by analogy (which is always unsafe), I have come to the conclusion that a whale's life is well within one hundred years, but I must admit that my argument is mainly theory and that there are but few facts with which it may be supported. Until recently, many naturalists held the view that whales lived for hundreds of years and that they did not reach adult size until long after birth. The latter contention has been proved utterly wrong, but of the former we have little new knowledge; neither do I see how we can ever estimate a whale's age with any degree of accuracy.

CHAPTER XX

A DEEP-SEA SPERM WHALE HUNT

EVERY time I see a sperm whale shot with a bomb harpoon from the bows of a steamship, I have more respect for the old-time hunters who kill the huge brutes with a hand harpoon and lance. The vitality of a sperm is enormous, and even when several bombs have exploded in its body the animal will often fight for hours before it spouts blood and dies.

When Captain Olsen secured the sixty-foot sperm, the skeleton of which was sent to the Museum, he got fast with one iron but did not kill the whale. After some time the vessel was near enough for a second shot, and Olsen fired a harpoon which was bent slightly upward at the point. The heavy iron, instead of penetrating the blubber, rebounded, and when it was drawn back by the winch was found to be actually bent double, the point of the bomb being within a few inches of the opposite end. It required three harpoons, each weighing one hundred and ten pounds, to finish the whale.

Yet with a magnificent courage which is only half appreciated by a landsman, the fearless New Bedford whalers attack these colossal animals with merely a

slender hand lance. Is it to be wondered at that our New England ancestors in such a training school made a history of which every American may well be proud?

Although deep-sea whaling is practically ended, year after year two or three ships drop away from the New Bedford wharves bound for the Hatteras

A female sperm whale at Aikawa, Japan. The head of the female is much more pointed than that of the male.

grounds for sperm whales. The cruises are short—only six or seven months—and the whales are killed, cut in, and tried out at sea in the old-time way. But even this lacks much of the glamour and romance of the old days, when sons of New Bedford's best families manned the boats, for now the crews are usually "Brava" negroes from the Kay Verde Islands, and

the only white men in the ship's company are the Captain and perhaps one or two of the Mates.

The excitement of the hunt is still there, however, and it takes the same nerve and the same cool head to fasten to and lance a sperm, as it did fifty years ago. I have had no personal experience in this kind of whaling, and therefore it does not fall within the scope of this book, but by way of contrast I have quoted a few extracts from the "Diary of a Whaling Cruise" by Victor Slocum, Harpooner.[1]

When a whale is cut in at sea the carcass is made fast to the lee side of the ship, and a skeleton platform of heavy planks is rigged to project beyond the whale, just above the surface. The mates take their places there and, with long "whale spades," make incisions through the blubber, which is stripped off in long blanket pieces by means of a block and tackle suspended from the mast. When the blubber is all in, the head is cut away and hauled on board, where the case is bailed, then the chains are slacked and the great carcass sinks into the green depths below to furnish food for thousands of hungry sharks.

Mr. Slocum tells of a sperm whale hunt in the following words:

At 4 A. M. all hands started to cut in, and just as we got through heaving, it was whales again—just after dinner. I was glad of that, and so was everybody else, for the work and exposure was beginning to pull on us, and a full stomach is none too good to go down in a boat with. The whales were close by, and a large school of them, too. There

[1] *Forest and Stream*, Vol. 67, 1907, pp. 928, 930, 968.

was just a breath of air stirring, so up went the sail and we paddled as noiselessly as aborigines upon our quarry.

There seemed to be whales everywhere, as far as the eye could reach, and all tame—just rolling and snorting in the water they lay in; once in a while one would jump like a

A posterior view of the Museum's sperm whale. Longitudinal cuts have been made through the blubber revealing the flesh beneath.

trout and make a splash like a waterfall, just to amuse himself.

At last we got close to one that suited us, and the boats went on head and head; there was not wind enough to manage with the sail, and dipping with the paddle was undesirable for it might result in a scare, so we lay perfectly still, right in his course, and on he came.

The harpooner stood up with his darting gun and iron,

and just as the great snout passed under our boat, he plunged it vertically right into the middle of the back. There was the report of the gun, a heaving of the boat clear of the water, a sensation like that of passing through a waterspout, and the dull explosion of the shell all in the space of the next second—then the leviathan stretched out dead. The bomb had killed him instantly, and it was well for

Cutting in a sperm whale at sea by the old-time method.

us that it did, for in the case of an ordinary iron being used, we would have been stove to pieces.

As we backed away, up came the black snout of another whale, and then two or three more. They did not seem to know that there was any mischief, and they rolled on top of the dead one as though nothing had happened. What an opportunity to get another one! If there had been a chance to mark our "fish" without getting stove by the others, and cutting loose as we did in a former case, we could have killed another and another; but that was impossible, so a "waif" was set for the second boat, and on

they came under oars. And how the bully boys rowed, for the cry had gone up that we were stove, and they pulled to save our lives.

As they got close, we urged them with our cheers and cries to go in and show what they were good for. Straight ahead they shot onto the "bunch," and just as they almost touched one that they had picked out, there was the curve of an iron through the air; the next minute they were going like the wind with the whale's flukes just clearing the stern, throwing spray in every direction.

The second mate, as cool as a cucumber and with a happy smile on his face, stood in the bow crouched down to keep as dry as possible, and with his bomb gun under his arm was yelling, "Haul in on the line!" There was no slacking our speed for him, with half a chance to get in a shot!

By night two whales were being worked on. That day's excitement and sport was worth a hundred dollars to me, for the whole thing was truly marvelous and it fully compensates for all the discomfort and privation that I have felt. . . .

The cutting in and trying out of the blubber is a prosy job, and nasty is no name for it. All hands strip down to a shirt, a pair of overalls rolled up to the knees, showing bare shins and sockless feet in large brogans, and in we go —grease from head to foot—day and night until the whale is all cut safely on board. If we tarried, bad weather would no doubt deprive us of our spoil.

It gives you a funny sensation at first to get into a deckful of blubber, with the slimy stuff around your exposed cuticle, and oil squashing out of your shoes at every step. But I am getting used to that now, and I feel like a veteran. . . . The try-works are run day and night, while there is blubber to feed them, and the refuse scrap is all the fuel they need, so it is very economical. They consist of two large caldrons mounted in brick work, near the center of the ship, and the whole structure is about six feet high. In

the dark, with the flame roaring out of the short chimneys and torches stuck on poles about the deck to give light, we must form an interesting spectacle. The men, moving about the deck under the peculiar illumination, look like conspirators in a comic opera.

CHAPTER XXI

THE RIGHT WHALE AND BOWHEAD

WHALING began more than a thousand years ago in the Bay of Biscay, on the coast of Spain. The Basques, who were the first hunters, soon learned that a certain kind of whale, among the hundreds which came into the bay, yielded finer baleen and a greater amount of oil than any other and therefore it was said to be the "right whale to kill."

In later years other species were gradually recognized, but the name "right whale" clung to the animal which was first hunted and thus it is known today. The scientific name, *Eubalæna glacialis,* bestowed upon it in 1789 by the Abbé Bonnaterre, is hardly appropriate, for the whale is not a lover of cold and does not go into the icy waters of the far north or south.

As years went by and right whales began to decrease in numbers, the hunters wandered afar and discovered in the waters about Davis Strait and Greenland another whale which was only a larger edition of the first and which eventually became known as the Greenland right whale, or bowhead; its smaller relative was then distinguished from it as the North Atlantic right whale.

A model of a right whale in the American Museum of Natural History. Prepared by Mr. James L. Clark under the direction of the author, from studies made at Amagansett, L. I.

THE RIGHT WHALE AND BOWHEAD

The bowhead is appropriately named because the fore part of the head is arched in almost a half-circle to make room for the enormous baleen which hangs in the mouth. This sometimes reaches a length of fourteen feet, and is so exceedingly fine and elastic

A small (calf) right whale on the beach at Amagansett, L. I. Note that no dorsal fin is present in this species.

that until recent years it often sold for $4 or $5 per pound.

Since an average sized bowhead yields 2,000 pounds[1] of baleen, a single animal was thus worth $8,000 or $10,000, and if a ship took two or three whales each season a profitable voyage was insured.

[1] A large whale sometimes yields 3000 pounds.

Although the baleen of the smaller right whale is of excellent quality, it seldom exceeds nine feet in length and consequently this species is not so valuable as its Arctic relative.

Whalebone is used principally in corsets, dress stays, whips, and other articles where strength and elasticity are required, but a few years ago several substitutes, such as "featherbone," "near-bone," etc., were perfected; since some of these proved fully as good as, and were very much cheaper than, baleen, it was no longer profitable to outfit expensive vessels and Arctic whaling abruptly ended.

Both the bowhead and right whale live upon minute crustaceans, called "brit," which are strained out by means of the mat of bristles on the inner side of the baleen plates; when the mouth is closed the whalebone folds back on both sides of the tongue, but straightens out again as the great lower jaw is dropped.

On the extreme end of the snout the right whale always has an oval roughened area, some two feet in length, called the "bonnet." This growth is produced by whale lice (*Cyamus*) and barnacles (*Coronula*), and although it is never absent in this species it is not found on the bowhead. Neither of these whales has a dorsal fin or folds on the ventral surface of the body, because their heads are so proportionately large that it is not necessary to increase the throat and mouth capacity by any external modifications.

The right whale is found only in temperate waters and does not go into the far north or south. It is

frequently taken by the shore whalers on the coasts of Japan, Australia, and South America, and is much less timid than the bowhead; it is also much quicker in its movements and is consequently a more dangerous whale to attack for the men who hunt in small boats with a hand harpoon and lance.

The bowhead, on the contrary, is exceedingly difficult to approach and very slow in its movements. It is exclusively a whale of the northern hemisphere, found only in the waters of the Arctic Ocean, Greenland, Hudson's Bay, and the Bering and Okhotsk Seas.

The finest bowhead grounds of today are those north of Bering Strait; as the ice breaks in the spring the whales follow the coast eastward, past Point Barrow, Alaska, as far as Banks Land. In the fall they again pass Point Barrow, going westward toward Wrangle Island, off the Siberian Coast.

Until Arctic whaling ceased, the ships used to leave San Francisco or Seattle in time to arrive at Point Barrow when the ice had broken sufficiently to allow them to smash their way through, and then cruise about under sail or tie up to the floe-ice where they could watch for whales from the masthead. The bowheads have such acute hearing and are so very timid that if the vessels use steam the propellers would be heard at a long distance and a whale would never be seen.

As soon as a whale is sighted, two or three small boats are lowered and each endeavors to be the first to reach the animal. The bowhead's blowholes are situated on the summit of a prominent bunch and

immediately behind them is a deep concavity over the base of the skull, and the "neck." When the whale lies at the surface only the blowholes and back show above water, and the attacking boat, coming from behind, endeavors to sail directly over the submerged neck. As the boat crosses the whale, the harpooner

Stripping the blubber from the large right whale at Amagansett. This specimen was fifty-four feet long and the largest that has yet been scientifically recorded.

thrusts a hand bomb-iron into the body; the bomb explodes and plows its way into the backbone, often killing the animal almost instantly.

The most difficult part of the work is to approach so noiselessly that the boat can cross the neck and place the bomb harpoon properly. If the whale is not killed at once it will usually run at considerable speed and, perhaps, dive under an ice-floe, in which case, if the boat does not carry sufficient line, the rope must be cut or certain destruction follows.

THE RIGHT WHALE AND BOWHEAD

As far back as tradition goes, the Eskimos of northern Alaska have been a race of mighty hunters and whalemen. At the largest villages, near every cape and headland, the passing of the dark days of winter marked the preparations for the great "devil dance," the invariable prelude to the spring whale hunt. About April 1, all the able-bodied men of the village would build across the ice to the water a road over which they might haul their boats and sleds. Their gear, consisting of a few fathoms of walrus-hide line fitted with sealskin bladders and tied to a short flint-headed spear, was primitive enough, but effective.

On the appearance of a bowhead all the boats took up a position in some comfortable nook along the edge of the ice-floe. When the whale came near a boat, the head man, whose place was usually in the stern, turned the canoe head-on toward the ice and sang the great death song, handed down from some famous whale-killing ancestor. This consumed fifteen or twenty minutes and then the harpooner thrust his flint-headed spear into the whale, doing little except frighten it nearly to death.

As it passed the next canoe the same performance, without the song, was repeated, continuing until the number of skin pokes made it impossible for the whale to dive. Then the natives paddled up to finish the animal with their flint-headed killing lances.

When the whale was dead a slip, or runway, had to be cut to the edge of the water and the carcass secured by walrus-hide lines passed round a rude wind-

lass constructed of a rounded cake of ice and a piece of driftwood. Then the huge body could be hoisted up, or, if the edge of the ice was too rough, cut in while rolling over and over in the water. The meat, blubber, "black skin," and bone were equally divided

The Amagansett whale covered with ice after the blubber had been stripped off the carcass.

and sent ashore on sleds, where they could be dressed and prepared for the winter.

The advent of the white man to engage in beach, or floe, whaling was a momentous event for the natives of northern Alaska and was the beginning of the end of their age-old methods. The first attempts made at Point Barrow in 1884 were without result, but two years later, under the Pacific Steam Whaling Company, a successful footing was gained and the Eskimos

began to adopt the white man's guns, bombs, and other gear.

The changes introduced by the white man were profound and the Eskimo of today has almost completely adopted his methods and materials; even the native boat—the only practical one for floe whaling—has been modified; the ancient superstitions are gone and the Eskimos have acquired a taste for the luxuries of civilization. Trading stations have been established at various points along the Arctic coast. Point Barrow boasts of an extensive native village besides several white residents, and further to the eastward the whalers often wintered at Herschel Island, increasing the profits of the voyage by trade in furs.

But bowhead whaling is almost a thing of the past. The present low price of baleen for either white man or Eskimo, and the closed season on fur have sealed the fate of the Arctic whaler.

The hunt for right whales still goes on but has been robbed of much of its picturesqueness, for the shore whalers soon learned that the animals could be shot with the harpoon-gun from their little steamers. But since the baleen has fallen in price they are not of very much greater value than the large fin whales; in Japan a humpback is really more appreciated because its flesh is much better for eating than that of any other species.

Right whales are often taken on the coast of Long Island, N. Y., and even now, at Amagansett, a whaleboat is kept in readiness to be launched whenever a spout is seen. In February, 1907, a crew under the

"We had to stand in freezing water while cutting away at the huge mass of flesh which encased the bones."

leadership of Captain Josh Edwards killed a large right whale, the skeleton and baleen of which were secured for the Museum at an expense of $3,200.

Captain Josh, as he was known to all the country near and far, was a genial old man, radiating good nature—a typical whaler of the old school. Although seventy-six years had whitened his hair, when the cry of "Ah! Blow-o-o-o!" had sounded through the village, he forgot his age and was in the first boat to leave the beach on the five-mile chase. And it was his arm, still strong under the weight of years, which sent the keen-edged lance at the first thrust straight into the lungs of the whale.

Mr. James L. Clark, formerly of the Museum, and myself, as soon as word of the whale was received, hastened to Amagansett, where we had two weeks of the hardest sort of work to secure the skeleton.

The carcass was beached just at the edge of low tide, where surf was continually breaking over it, and we had to stand in freezing water while cutting away at the huge mass of flesh which encased the bones.

The temperature was +12°, and, to add to our difficulties, on the second day a terrific storm almost buried the carcass in sand so that it was necessary to build a breakwater of flesh against the surf, and laboriously dig out the skeleton bone by bone.

The Amagansett whale was an old female, fifty-four feet long, and proved to be the largest specimen which had then been recorded. On the same day that it was captured, a smaller thirty-eight-foot whale, evi-

dently the calf of the first, was killed at Wainscott, Long Island. This skeleton was also secured, and was eventually sent to London, while the Amagansett whale with its baleen remains in the Museum to be mounted in the Hall of Water Mammals. Just a

The baleen of a right whale. This specimen had whalebone eight feet long.

year later another right whale, a twenty-eight-foot calf, was killed at Amagansett, but its carcass was lost in a storm.

As yet it is impossible to say with authority just how many species of right whales exist. Some years ago Lieutenant Maury, after studying the daily logs of hundreds of whaling vessels, prepared a chart which appears to show that the animals do not cross the

belt of tropical water at the Equator, and that the right whales of the northern and southern hemispheres are thus definitely separated. Acting upon the supposition that since there could be no communication between them these whales must certainly have become differentiated enough to form distinct species, each has been given a scientific name.

In the light of present knowledge, however, this apparent separation cannot be considered sufficient ground for dividing the right whales into northern and southern species, unless a critical comparison of their external and internal anatomy reveals constant differences.

CHAPTER XXII

THE BOTTLENOSE WHALE AND HOW IT IS HUNTED

THERE is a strange and interesting family of small-toothed whales known as the ziphioids, which owes its commercial importance to a single species, the bottlenose. This whale seldom reaches a greater length than thirty feet, and takes its name from the bottle-like snout or beak which, at the extreme tip of the lower jaw, bears two small pointed teeth almost concealed in the gum.

These whales were never extensively hunted until 1882, when Captain David Gray went north in the schooner *Eclipse* and returned with a cargo of oil which demonstrated the profits of the venture. The next year he got two hundred bottlenoses and it was not long before the Norwegians began operations on a large scale. In 1891, from Norway alone, seventy ships sailed for bottlenoses and killed a total of three thousand animals. In later years the business declined because of the scarcity of whales and the difficulties and dangers of the hunt, for in no branch of modern whaling is there such a large percentage of fatal accidents.

The bottlenose ships are small schooners of thirty to fifty tons, carrying several small boats and usually

armed with six guns fore and aft; in addition, each boat has a gun mounted on the very bow. The guns are much smaller than those of the steam whalers and shoot harpoons only three feet long, with several strong barbs but without explosive points. Each iron carries with it twenty or thirty fathoms of "forerunner," which leads to the main five-hundred-fathom line coiled in a tub at the stern of the small boat. As soon as a whale has been struck, a turn of the rope is thrown about a small post called the "puller," to check the speed of the running line. The small boats carry four sailors each—two at the oars, one to steer, and one at the gun.

The work in the bitter cold and freezing water, to say nothing of the ever-present possibility of having one's head, arm, or leg shorn clean off by the whizzing rope, robs bottlenose hunting of its attractiveness, and it is difficult, at present, to find competent men who will ship even for a short cruise. Therefore these whales have been but little studied and there is much to learn about their habits and family life.

Most of our present knowledge is due to the observations of Captain David Gray and Mr. Axel Ohlin, who in 1891 spent two years on a bottlenose vessel. According to Mr. Ohlin, when a herd of whales is sighted, if it will not come within range of the ship, one or two boats are launched which slip quietly toward the animals. Generally the whales spout several times at intervals of thirty or forty seconds and then sound, to remain below sometimes for an hour or more. The boats lie to where the school has dis-

appeared and when the whales again rise to the surface are quietly swung about until the gunner gets a fair shot.

If the harpoon misses, which often happens in a choppy sea, the gun is again loaded and the line hauled in with the greatest haste. Instead of being frightened by the report, the whale's curiosity is usually aroused, and an opportunity for a second shot is soon given.

When a bottlenose has been hit, the harpooner immediately twists the line several times around the puller, the steersman makes sure that the rope is clear, and one of the oarsmen hoists a flag to signal the other boats or the ship to stand by in case of accident.

The whale usually dives straight downward at tremendous speed and has been known to take out five hundred fathoms of line in two minutes. At such times, no matter how carefully the harpoon rope may have been coiled in the stern, there is great danger that it may run foul or get entangled. If a knot is formed, the line must be cut instantly or the boat will be dragged under water. Not infrequently the line gets looped about the body of one of the sailors and the man is either killed or loses an arm or leg.

When the bottlenose reappears after the first rush, usually he is almost exhausted and lies quietly at the surface spouting frequently. A second boat then tries to get near enough for a shot or to thrust a hand lance into the whale's lungs.

Like all cetaceans, just before the bottlenose dies

it goes into the death flurry and plunges back and forth lashing the water into foam or throwing its body into the air. It is well to keep at a safe distance during the flurry or a stove boat will result.

When the whale has been killed, the freezing line is hauled in and the animal towed to the vessel to be cut in. The blubber is stripped off as the body rolls over, is sliced into thin sections, and thrown into iron cisterns in the ship's hold; the carcass is then left to sink.

A full-grown male bottlenose will yield about two tons of oil and two hundredweight of spermaceti, which is contained in the "forehead" in the same relative position as the "case" of the sperm whale. The great masses of fat at the bases of the jawbones are also of considerable value. An analysis of the bottlenose oil and spermaceti shows it to be as fine in quality as that of the sperm, and the whales yield a large amount considering their small size.

The tremendous strength and endurance of the bottlenose are proverbial and I doubt if many of the extraordinary tales which one hears in the cabins of the shore whaling vessels are greatly exaggerated. It seems certain that this whale can, and does, remain under water longer than any other large cetacean, and its strength and endurance in proportion to its size are probably surpassed only by the killer (*Orca orca*).

Bottlenose whales are said to throw their entire bodies into the air, their powerful flukes giving such tremendous power to the leap that they take the water

again headfirst instead of falling back helplessly on their sides.

The animals are gregarious and usually travel in herds of five to ten individuals; more than ten are rare, but many different schools may be in sight at the same time, separated from each other by only a short distance. The old bulls sometimes lead a solitary life, but herds of young bulls, cows, and calves, led by a bull, are often seen.

The differences of age and sex can easily be determined both by the color and the shape of the head. The young vary from black to light brown in the older individuals and females, and old bulls are often almost yellow, with much white about the head and neck.

The mating period appears to be in April or May and the period of gestation about twelve months, although there is little definite information concerning breeding habits. Like all cetaceans, the young are very large at birth, and Captain Gray writes that from a female bottlenose twenty-nine feet long he removed a fœtus ten feet in length by five feet six inches in circumference. A fœtus of slightly larger size has also been recorded by Guldberg.

The hearing of the bottlenose is very acute and a school of whales will detect the sound of a ship's propeller at a long distance, but instead of being frightened, the animals often surround the ship or boats and exhibit the greatest curiosity; nor will they leave until they have thoroughly examined the strange object.

A herd will never leave a wounded comrade while it is still alive, but swim away as soon as it is dead. The hunters often take advantage of this loyalty, after they are fast to a bottlenose, by harpooning a second before the first is killed. The whales crowd about the wounded ones, coming in the most mysterious manner from all parts of the compass, and sometimes ten or fifteen can be taken before the school is lost.

The bottlenose appears to feed exclusively upon a bluish-white cuttlefish about six inches long, for nothing else has been taken from their stomachs as far as I have been able to learn. Like the orca and sperm whale, when a bottlenose is killed it almost always ejects large quantities of cuttlefish from its mouth. Judging by the length of time the animals remain under water and their heavy spouts when reappearing, they must have to go to a great depth to find their food. The two minute teeth at the tip of the lower jaw can be of no assistance whatever in feeding and will undoubtedly eventually disappear altogether.

The bottlenose is common in the North Atlantic and Arctic Oceans, and although rare on the Finmark coast are numerous about Spitzbergen, Iceland, Nova Zembla, East and West Greenland, Davis Straits, and Labrador. Near the Faroe Islands and Iceland they have been most relentlessly persecuted and hundreds of whales are taken annually.

Specimens have never been recorded from the Pacific, but Captains H. G. Melsom and Fred Olsen assured me that they had seen bottlenoses along the northern coast of Japan not far from Aikawa. Whale-

men of their experience who have hunted the animals in the Atlantic could hardly be mistaken, and I feel certain that before long specimens will be taken in Pacific waters.

Whether or not they will prove to be specifically identical with the Atlantic bottlenose it is, of course, impossible to say. So far as present information extends there appears to be but a single species, the *Hyperoödon rostratum,* described by Müller in 1776. Because of the great changes which age and sex produce in color and in the shape of the head, numerous names have been given to individuals which have all proved to be specifically identical with the common form, *H. rostratum.*

Although the bottlenose is the only commercially important member of the family Ziphiidæ, and is consequently the best known, the other species of this strange group are not less interesting. All the ziphioids are characterized by the tail which has no notch in the center and by the one or two pairs of teeth in the lower jaw, near or at the end, which sometimes develop in a most unusual way.

In one species, Layard's whale (*Mesoplodon layardi*), the two flat, strap-like teeth in the lower jaw grow upward to a height of eight or ten inches and sometimes bend over the long pointed snout, preventing the animal from opening its mouth more than an inch or two. How the whale feeds when the jaws are thus locked is a mystery.

In one species, *Mesoplodon grayi,* besides the pair of functional teeth near the end of the lower jaw, a

row of small teeth are present on either side, entirely embedded in the gum of the upper jaw. These never appear on the surface, even in the oldest animals, and are similar to the teeth concealed in the upper jaw of the sperm whale. In ancient times they were undoubtedly all well developed, but as the food of the whales changed, and the teeth became of less and less importance, they gradually began to disappear.

The front portion of the skull of all the ziphioid whales is produced in the form of a long cylinder of bone which, although open in the middle in young specimens, gradually fills up by ossification of the central cartilage and eventually becomes of almost flinty hardness.

Because of the extreme solidity of this portion of the skull it fossilizes very perfectly. When digging for the fortifications about the city of Antwerp hundreds of these bones and teeth were found, and many have been taken from the "Red Crag" deposits in England.

Ziphioid whales are evidently an ancient group which was once very widely distributed. They are found today in the greatest numbers in the seas about New Zealand and Australia, but single specimens are continually appearing unexpectedly in almost every part of the world.

Recently a specimen was washed ashore on the coast of New Jersey and the skeleton sent to me for identification. I was surprised to find that it represented a species, *Mesoplodon densirostris,* which before had been recorded only near New Zealand.

When in Japan in 1910 I saw a photograph of a whale which was said to occur at certain times of the year only in Tokyo Bay, and when a skeleton was finally secured for the American Museum of Natural History, the whale was found to represent an exceedingly rare species, *Berardius bairdi,* which had been taken only in Alaskan waters.

Thus, it is evident that at the present time we know almost nothing about the distribution of these strange whales. Every year or two new species are being discovered and there is evidence to show that the family, as it now exists, is the last survivor of a once numerous group.

CHAPTER XXIII

HUNTING WHITE WHALES IN THE ST. LAWRENCE RIVER

THE porpoises and dolphins which form the family Delphinidæ are in all essential respects toothed whales.[1]

The name "porpoise" is usually applied to the round-headed members of the family, while "dolphin" distinguishes those which have pointed snouts or beaks.

The fish (*Coryphæna*), properly called dolphin, which passes through brilliant changes of color when dying, is often confused with the cetacean because of its name, although, of course, they are not related in the remotest degree. Because of this confusion I seldom use the name dolphin but speak of all members of the group as porpoises.

There are so many species of porpoises that it would not be possible in a book of this character to describe them all; therefore, as with the whales, only those of commercial importance will be considered. Most of the members of this family are small, only the killer whale (see Chapter XVIII) and the blackfish exceeding twenty feet in length.

[1] A glance at the classification in the Appendix will explain their relationship to other cetaceans.

The white whale, or white porpoise. The skin of this species furnishes much of the "porpoise hide" leather of commerce.

HUNTING WHITE WHALES

The white porpoise, or white whale as it is more usually called, is not only the most beautiful but also one of the most important members of the family, for it is this animal which furnishes much of the porpoise hide and porpoise oil of commerce.

Like its nearest relative, the narwhal, it is a northern species, seldom being found where the water is far above the freezing point; but during the spring the animals come into the St. Lawrence River by thousands and some remain throughout the summer.

In early June of 1909 I left New York for the little French town of Tadoussac at the mouth of the Saguenay River to study these interesting cetaceans and secure skeletons and plaster casts for exhibition in the Museum.

There are a number of French dwellers along the St. Lawrence River who live by selling the skins and oil of the *Marsouin blanc,* and arrangements were made to hunt with one of them. The day before, I had driven twenty-five miles from Tadoussac to the porpoise hunter's cabin and in the morning, shortly after five o'clock, my cameras were loaded into one of the canoes and we paddled around the rocky headland into the little cove where the yawl from which we were to hunt lay at anchor.

A run of four hours took us across the St. Lawrence and we began beating up the south shore against a strong head wind. It was slow work and not until three o'clock in the afternoon did we drop anchor in a shallow cove at Apple Island, our destination. There is a strong tide rip about the eastern end of this little

point of land, and in it the whales play back and forth, feeding on the small fish which drift in with the current. After stowing the sail, one of the canoes with two of the men put out from the harbor while the three of us who remained climbed over the rocks to the highest point of the island.

The wind had changed and blew strongly from the southwest, topping the long swells with white and churning the waves into foam as they broke along the ragged shore line. Three or four whales could be seen some distance away and the canoe headed for them, as it swung around the point, in spite of the rough water. With my glasses, I watched the little craft bobbing about among the whitecaps, slowly nearing the specter-like forms which rose every few seconds and sank, only to appear again a few feet farther on.

When they were about one hundred yards away, the men became motionless and the boat drifted onward with the wind. The porpoises paid not the slightest attention to the canoe and went down only a few feet ahead. As they left the water the man in the bow suddenly leaned forward and with gun ready waited the reappearance of the animals. They came up not twenty feet away and hardly had their snowy heads appeared above the surface when a thin white line of smoke shot from the gun and the nearest whale threw itself high in the air, falling back in a cloud of spray. Instantly the canoe leaped forward, the man in the bow balancing the harpoon, but the whale straightened out and sank before he could

throw the iron. With disappointed faces the men returned and climbed the rock where we were sitting.

We watched until six o'clock but no more porpoises appeared, and I was glad when we reached the boat for the wind cut like a knife as it drove across the hilltop. The cabin was so small that we could not

The posterior part of a white whale. The entire animal is snow white except for a narrow edging of brown on the flukes and flippers. The young of this species are entirely brown.

sit upright and it was next to impossible to move when we were all there together; however, it was warm and that was something. After our dinner of stew, made from potatoes and onions, we packed ourselves away for the night, each on a narrow board which served as a bunk.

Next morning I was awakened by the regular lap, lap, lap of the water against the bows, and knew that

the boat was already under way. Crawling down from my narrow shelf I wriggled through the hatchway to the deck above. It was a perfect morning, the sun already an hour high and a fresh breeze coming from the west. We were headed down the river for an island four miles distant, about the lower end of which, with the glass, a large school of whales could be seen playing back and forth in the tide rips. I stretched out on top of the cabin drinking in the fresh salt air and enjoying the warm sunshine which was doubly welcome after the raw wind of the day before.

As we neared the upper end of the island, I heard a confused murmur of sounds, and with a question turned to the porpoise hunter. *"Myack,"* he said, and I saw that the shore was lined with a great flock of eider ducks. He threw the tiller over and as we drew in toward the land one or two stragglers rose and then, with a perfect roar of wings, the whole flock launched itself into the air. It was a magnificent sight as the great birds whirled past us, the black and white plumage of the males flashing in the sunlight. I watched them through my glasses until, with a sudden graceful curve, they swung down clear to the water and were lost in the blue wisps of fog which still hung in the air.

We sailed along abreast of the island and dropped anchor in a perfect rock-walled harbor at its lower end. Not far away in the tide rip a school of white whales were darting back and forth after the fleeing capelan.

My excitement was at fever heat, for since the water was fairly smooth I was to try my luck at shooting.

When the canoe was lifted over the side, we slid away from the yawl, out of the harbor, and into the upper end of the tide rip, with hardly a sound save the drip of water from the paddle blades. On the gunwale in front rested the end of the heavy shotgun loaded with a lead ball, and at the right lay the slen-

"A big white fellow slipped under only a hundred feet away, headed directly for us."

der harpoon, the line neatly coiled and fastened to a bulky cedar float.

We had hardly three hundred yards to paddle and in a few moments were in the midst of the whales, the short, metallic puffs as they spouted sounding on every side. There were many young animals in the school, their brownish bodies showing in striking contrast to the snowy backs of the old ones, and we drifted quietly among them, waiting to pick our specimen. It was a sore temptation as whale after whale passed close beside us, and time and again I sighted along

the rusty barrel of the gun at a swirling patch of water, only to drop the muzzle as a brown back appeared at the surface. The old whales seemed to know that danger lay in the silent gray object which had appeared so suddenly near them, and with the nicest accuracy gauged the shooting distance, keeping just within the safety zone.

We floated along on the current, passing most of the school, and headed for a little group of white animals which were feeding a short distance away from the others. They did not seem to be disturbed as we neared them, and we hardly dared to breathe when a big white fellow slipped under only a hundred feet away, headed directly for us.

Up he came with a rush and down again, so close that we could see the water run in little ripples off his snow-white back. My fingers trembled on the trigger of the gun but he was still coming toward us and in a few seconds the telltale patch of green water began to smooth out right ahead. I fired at the instant there was a glint of the snowy head over the long brown gun barrel.

The shock of the heavy charge whirled me half around in the canoe and there was barely time to snatch the harpoon before we were at the spot where the porpoise was thrashing about on the surface of the water. At a side thrust from the iron the whale threw itself high into the air, falling back in a cloud of spray. A mad rush to one side and again the ghostly form shot from the water, the white body writhing as it fell back.

The whale fought desperately to free itself, rushing from side to side and lashing the water into foam with its flukes. We had thrown the float overboard at the first leap and were waiting a short distance away for a second shot. The animal's struggles finally became less violent and as it lay on the surface trying hard to keep upright I fired a second ball into its neck; with a last convulsive twist the beautiful creature slowly sank. We paddled for the buoy which was bobbing about near us and checked the carcass before it had gone far down, raising it to the surface by forcing the canoe ahead.

The two men in the other boat had been watching from near the shore and when they saw that the whale was dead paddled out to help us tow it around the headland into the harbor near the yawl. We beached it in a sandy cove where the gray rock wall rose in a jagged mass, making a perfect background for the white body, its purity intensified by the bright red streaks of blood which dripped from the bullet holes. There was something almost uncanny about the picture, the beautiful, ghostlike animal, a very Spirit of the North, seeming strangely out of place away from its ice-bound home.

Its body was unmarked by the slightest tinge of color except at the outer margin of the tail which was bordered with grayish-brown. Also the short broad fins or flippers, strongly upcurved at their ends, were edged with brown, becoming darker at the tips. The small head, which, unlike most cetaceans, joined the body by a distinct neck, ended in a short stubby

snout, or "lip," and seemed remarkably out of proportion to the animal's size. Each jaw was armed with nine, rather weak, cylindrical teeth, the well-worn tips showing that our specimen was fully adult, although not old.

"We beached it in a sandy cove, where the gray rock wall rose in a jagged mass, making a perfect background for the white body, its purity intensified by the bright red streaks of blood which dripped from the bullet holes."

Because the vertebræ of the neck are not joined together as in other porpoises, the white whale and narwhal are placed in a separate division, or subfamily of the group; their relationship is also shown in other ways, one of which is the absence in both of a dorsal fin.

While I measured and photographed the porpoise I had killed, the other men climbed the rocks to see if they could discover where the school had gone. In about an hour they hurried back to the cove and reported that the whales were near the upper end of the island following a tide rip which swung in close to shore. The wind, however, had begun to freshen and blew a perfect gale directly toward the island.

I was anxious to get some pictures of the white porpoises, but it would have been useless to think of photographing in all that rush of wind and spray, so the four men put off in the canoes while I continued work upon the dead whale. In about three hours they returned, each towing a full-grown porpoise and almost exhausted. It had been hard and dangerous work to kill the whales and bring them in, for the wind drove with tremendous force across the clear stretch of river, catching the tops of the waves and whirling the spray like snow. We stayed at the island for three days, killing two more porpoises and taking the skin, oil, and skeletons. After the blubber had been scraped from the skins they had a value, in the raw state, of about seven dollars, and a considerable amount of oil was obtained from the fat. The skeletons were what I was particularly interested in, and with four in the hold of the yawl and a freshly killed porpoise towing behind, we sailed down the river, past the rocky entrance to the Saguenay, and into the beautiful harbor where three hundred years before the hardy French explorers had dropped anchor and on its shores built the quaint little town of Tadoussac.

CHAPTER XXIV

THE BOTTLENOSE PORPOISE IN CAPTIVITY

FOR two hundred years a porpoise fishery has been conducted in a somewhat desultory manner at Cape Hatteras, North Carolina. The animal which forms the basis of this industry is the bottlenose porpoise (*Tursiops truncatus*), one of the commonest species of the Atlantic coast, which is especially abundant at Hatteras during the winter.

The present fishery is owned by Mr. Joseph K. Nye of New Bedford, Massachusetts, a gentleman who fortunately appreciates the opportunities offered at Cape Hatteras for studying this porpoise and its life history. Through his courtesy several live specimens were presented to the New York Zoölogical Society and were transported to the New York Aquarium under the direction of Dr. Charles H. Townsend, its Director.

Dr. Townsend deserves the greatest credit for his perseverance, after several failures, in finally bringing to this city nine porpoises, four of which lived seven months and one twenty-nine months in a circular pool thirty-seven feet in diameter and seven feet deep, in the Aquarium.

This is a record which has never been equaled and, indeed, I am not aware that any other aquarium of

Photo by Dr. C. H. Townsend

"They are taken with a net of extra heavy twine, about 1,000 feet long, which is placed about 200 yards outside the line of surf and parallel with it."

the world has a pool large enough to contain a school of such lively ocean rangers.

During the months these animals lived under Dr. Townsend's eyes, he was given an opportunity such as no other naturalist has ever had to study and observe their habits and daily life. The results of his observations have been published by the New York Zoölogical Society [1] and with Dr. Townsend's permission I am quoting in this chapter portions of his interesting paper and republishing several of his photographs.

Cape Hatteras is the only point in North America where a porpoise fishery has ever been regularly conducted, and where such animals can be taken near the shore and beached with drag seines. The Bottle-nosed porpoise winters off our South Atlantic coast and is quite common in the vicinity of Cape Hatteras during the fall, winter and spring months. Schools of porpoises may be seen passing every day just outside the surf.

They are taken with a net of extra heavy twine, about one thousand feet long, which is placed about two hundred yards outside the line of surf and parallel with it. At each end there is a boat in waiting, ready to carry the haul lines directly ashore as soon as a band of porpoises has passed between the net and the surf. After the lines have been carried ashore the porpoises are considered fairly secure, for they do not often attempt to cross the haul lines, and even when they do, can usually be frightened back by having someone shake each line continuously while it is being hauled in.

It requires considerable time to bring the ends of the big seine to the beach, but even then some of the porpoises

[1] "The Porpoise in Captivity." By Charles Haskins Townsend. *Zoölogica*, Vol. I, No. 16.

Photo by E. R. Sanborn.

"Thirty-three porpoises were beached in the haul of the seine which provided our specimens. . . . Porpoises are valuable for their jaw oil, hides and body blubber, the value of each being in the order given."

may get away by leaping over the net or attempting to dive under it. The former can be prevented to some extent by sending a boat to the outer curve of the net, which serves to keep the animals from charging against it. Some of those that attempt to dive underneath become enmeshed and, being air breathers, are soon drowned. Thirty-three porpoises were beached in the haul of the seine which provided our specimens. The greatest number taken in a single year appears to have been fifteen hundred.

Porpoises are valuable for their jaw oil, hides and body blubber, the value of each being in the order given. The oil derived from the jaws represents the greater part of the value, being worth ordinarily twenty dollars a gallon, refined. It is extracted from the broad posterior branches of the lower jaw, and is universally used for the lubrication of watches, clocks and similarly delicate mechanisms. An attempt was made at the Hatteras fishery to utilize the carcasses of these animals for fertilizer, but, as the location is isolated, the question of fuel for the furnace proved too serious and the project was abandoned.

The Bottlenosed Porpoise (*Tursiops truncatus*) is the only species of porpoise that has ever been taken at the Hatteras fishery. Our eight-foot specimens represent the average size. A number of animals were measured in November, however, which exceeded nine feet in length. The greatest length for this species at Hatteras is twelve feet, but this is altogether unusual. Measurements and weights taken in November show that a porpoise five and a half feet long weighs 100 pounds; six feet, 160 pounds; seven feet, 200 pounds; and eight feet, 300 pounds.

The movement of porpoises along the great beach which extends in a general southwesterly direction from Cape Hatteras is usually close to the surf. The bands appear to move in both directions. Residents of Hatteras are of the opinion that the majority of those in the vicinity of Hatteras Inlet move to the eastward, turning south from

the Cape, whence they gradually swing back to the mainland. They have not, however, been followed away from the beach, and their winter movements are not known with certainty.

Immediately after their capture at Hatteras, where they were brought to land with a large drag-seine, the porpoises were placed for twenty-four hours in a deep salt water pond just back of the ocean beach. Here they had an opportunity to recover somewhat from the fright of capture, and to rest in cool water. No chances whatever were taken in the matter of temperature. On the beach their natural warmth of body would no doubt have been greatly increased by the hot sunshine.

The following day they were seined out of the pond and placed in the shipping tanks, which were then hoisted on board a schooner and at once filled with water. During the voyage through the fresh waters of Pamlico Sound and the Great Dismal Swamp Canal, the water in the tanks was changed whenever it became warm. After reaching the New York steamer at Norfolk the cooling of the porpoise tanks en route was greatly simplified by the use of the steamer's salt water hose.

The shipping of porpoises alive is therefore a simple matter. The adult animals readily stand transportation, while the young do not. If carried in long, narrow boxes large enough to accommodate them without rubbing, and if kept supplied with sufficient cold water to support and cover them, they can be handled easily enough. There is probably no reason why a porpoise, under such conditions, should not be carried in a tank many times the two days' journey from Hatteras to New York, although on a journey by rail the changing of the water would be difficult and expensive. While its temperature could be controlled by the use of ice, the water carried without changing would be seriously fouled, for two or three days. The question of food could be disregarded for a few days without injury.

The captive porpoises are very lively and keep swimming day and night, rising to blow usually with each circuit of the pool. Being kept in shallow water, they probably breathe oftener than they would in deep water. They often swim under water, belly up, like seals, but never lie upon the bottom or bask at the surface as the latter do. Visitors ask whether they ever rest—a question not easy to answer. If they do, it is apparently without cessation of forward motion. Nevertheless they are quieter at night when most of the lights are cut off, and do not indulge in boisterous play.

For a time two of them habitually moved from left to right, while three took the opposite course, but this practice soon became less regular and is apparently breaking up. Sometimes the speed is slow, but more often it is rather rapid. Occasionally they indulge in a bit of racing that makes high waves, the water surging up to the coping of the pool. A porpoise *speeding* around the pool can make a right-angled turn as quickly as a frightened fish, without lessening speed.

When being fed all regularity of movement is abandoned, and they rush in various directions to seize at the surface the fishes slowly thrown into the pool. This continues for some time after feeding, until all sunken scraps are gleaned from the bottom. All food is swallowed under water. Frequently a porpoise will play with a dead fish, thrusting its head clear of the water and throwing the fish from five to ten feet away, when it is recovered and thrown again. Such play may last half an hour, or until the fish is reduced to scraps too small to be thrown. It is not uncommon for two or three of them to be engaged in throwing fishes at the same time and the practice is becoming habitual.

Several times a day they indulge in very active play, darting with mock ferocity after each other, or leaping quite clear of the water and striking with heavy splashes. They often swim on their backs, with the jaws out of water,

Photo by Dr. C. H. Townsend.

"Immediately after their capture at Hatteras . . . the porpoises were placed for 24 hours in a deep salt water pond, just back of the ocean beach. Here they had an opportunity to recover somewhat from the fright of capture, and to rest in cool water. . . . The following day they were seined out of the pond and placed in the shipping tanks, which were then hoisted on board a schooner and at once filled with water."

or on their sides repeatedly striking the surface with the head. When leaping a favorite trick is to throw the body around until the dorsal fin is forward, with a resulting splash that sends the spray quite out on the floor. A high leap by one of them is usually a signal that starts them all to leaping. Our fears that they might leap quite out of the pool were unfounded; they are clever enough to avoid the wall which surrounds them.

Another game is played by going around the pool with short dives, each time striking the surface with the flat of the tail. When the pool is entirely full of water their play is livelier than when the water level is lowered. The increased depth gives them more confidence and they often turn complete forward and backward somersaults.

The ordinary swimming motion of the tail is up and down, but, if playfully charged by a companion, the porpoise seems to make a spurt ahead by more or less side action of the tail. This is not easy to determine, however, and may be more apparent than real, as the water is too much disturbed by high speed dashes for accurate observation. The animal undoubtedly relies upon its tail for propulsion, the flippers or pectoral fins being brought into action in making turning movements. Several of the porpoises have lately taken to swimming on their backs, and the movement of the flippers and tail at such times is easily seen contrasted with the white under parts. In swimming on the back, however, there is considerable lateral action of the tail.

Frequently three or four of them will bunch together in the center of the pool, rolling and rubbing against each other in a ball-like mass suggestive of the tussling of puppies. This may at times mean that they are merely scratching, as the single porpoise kept in the Aquarium for two and a half months last summer frequently rubbed his sides or back against the back of a large sturgeon kept in the same pool. This injured porpoise indulged in no play and

swam day and night in the same circle from right to left, but always fed freely.

There is considerable mobility of the neck of the porpoise, an animal lacking all outward appearance of a neck. The head can be turned down at an angle of about 45 degrees to the body, and can be turned as far sideways with equal readiness. These motions can be seen at feeding time and when the animals are tossing fishes.

There is no evidence that the porpoise can see out of water. In throwing a fish the head is often thrust well above the surface, but the animal seems to be always intent on its plaything, entirely disregarding the visitors leaning over the rail five or six feet away. While a fish thrown into the water is promptly seized, the porpoise pays no attention to a fish suspended by a thread two inches above the surface. If the eyes of porpoises and other whales were fitted for observation above the surface of the water, as are the eyes of seals, they might long ago have learned to use them in the same way.[1]

Porpoises instantly recognize any change that may occur in connection with the water level of the pool. The entirely noiseless opening of a distant valve to lower the water is apparent to them and may stop their play temporarily. A pool only thirty-seven feet in diameter does not of course afford space for the high activity of which the porpoise is capable. Nevertheless they often leap three feet or more clear of the surface, sometimes striking the water forcibly enough to throw spray thirty feet into the air. The visitor soon gets the impression that they enjoy life even in captivity and their keepers, while always vigilant

[1] I do not believe that because the porpoise would not seize a fish suspended above the water, it is evidence that it could not see it. Not being accustomed to take its food out of the water, the animal probably did not know what the fish was. A wounded porpoise which I kept alive for some time on a ship in the Pacific could see my hand if it was brought within a few feet of its eyes. R. C. A.

Photo by E. R. Sanborn

"The captive porpoises are very lively, and keep swimming day and night, rising to blow usually with each circuit of the pool."

as to their needs, have ceased to be concerned about their safety, regarding them as almost domesticated animals.

The naturally sociable and gregarious habits of porpoises is evidently not lessened by captivity. Sometimes they seize each other by the back just behind the dorsal fin, but there are no tooth marks on any of them and it is probably done in play. The indications are that they are altogether amiable and inoffensive toward each other. The only species of porpoise destructive to its kind is the well-known "Killer" (*Orca gladiator*).

Our porpoises were observed mating in January, and again in March and April. It is possible that they will breed in captivity if their lives are not shortened by indoor life.[1]

Our porpoises were heavy feeders, the five consuming about ninety pounds of fresh fish a day. This quantity of food has kept them in good condition, apparently without loss of weight. For several days after their arrival they would eat nothing, but at the end of a week they began to take live fishes and, after having once started to feed, it was not difficult to get them to take dead fish. A few days of hunger brought them around, as it does in the case of the newly captured seal or sea lion. Their principal food is herring and tomcod purchased in the markets. The live crabs thrown to them at various times were quickly seized and much tossed about, but were not eaten.

The keeping of porpoises in captivity has presented some difficulties with the water supply, their excrement constantly discoloring the water. The pool cannot be drained empty and cleaned, like those used for seals, as stranded, and consequently frightened, porpoises beat the ground with their tails so violently that they would be injured by the daily emptying of the pool. The water is now being kept fairly clear by carrying extra pipe lines to the pool and greatly increasing the flow of water. The pool is supplied with

[1] Unfortunately all the female porpoises died at the time Dr. Townsend's paper was passing through the press. R. C. A.

brackish and rather impure water pumped from New York Harbor, as it is not practicable to supply it with pure sea water from the Aquarium's large storage reservoir, on account of the fact that porpoises would rapidly discolor the stored sea-water which is so important to the health of the collection of marine fishes in the Aquarium.

The necessity of keeping them in the water of the Harbor, and exhibiting them in a public exhibition room which has to be heated during the winter makes it, of course, impossible to hold them under entirely favorable conditions, yet they are undoubtedly doing well. They could no doubt be kept for some time in fresh water, as is sometimes done with seals and sea lions, but they would eventually suffer from the lack of the salts contained in sea water. Porpoises, perhaps of this species, frequently enter the fresh waters of Pamlico Sound through the inlets southwest of Hatteras, and many species of marine porpoises make long journeys into the fresh waters of rivers.

CHAPTER XXV

THE BLACKFISH

THE blackfish, the most gregarious and one of the largest members of the porpoise family, is sometimes called the "pilot whale" because it blindly follows a leader and the herds can be driven almost like a flock of sheep.

Several species have been recognized in different oceans of the world, but the most common and widely distributed is the one called by naturalists *Globicephalus melas,* which occurs in great schools on both sides of the North Atlantic.

It is perhaps most abundant about the Faroe Islands north of Scotland, where the natives take advantage of its follow-the-leader habit and drive the herds into narrow fjords to be slaughtered by the hundreds and used for oil and food. These blackfish hunts of the Faroes are famous and lend a welcome touch of romance and picturesqueness to the present-day whaling which contains so little of the old-time glamour.

When a school of *grind,* as they are called by the Faroe men, is sighted, word is telephoned along the coast, and whether it is night or day, boats begin to assemble to surround the porpoises. The herd is slowly and quietly driven toward the mouth of the fjord which has been selected by the first boats on the scene

—preferably a fjord with shallow water at the head—and as reinforcements arrive the men are arranged in definite formation by the director of the hunt.

The progress of the herd is very slow at first, about a mile an hour, but when once well within the fjord itself the boat crews close in, begin to beat the water vigorously with their oars, and to throw stones among the most backward of the school.

Perhaps the porpoises may suddenly turn and break for the open sea, and then follows a race by the outlying boats to cut them off. Instead of diving or rushing the boats which block their way, the guileless *grind* turn about tumultuously and once more race up the fjord. When the school is thoroughly scared, they break away again and again with a mad dash, only to be turned back by the encircling boats, until they reach the shallow water at the end of the fjord and rush far up toward the shelving shore.

As soon as they begin floundering about at the water's edge, a little crowd of fishermen who have been hiding behind the rocks, dash into the water and grasping the stranded whales by the fins plunge sharp knives into the necks of the struggling brutes.

Meanwhile in slightly deeper water the boatmen are spearing the porpoises not already stranded. Everywhere there is an atmosphere of carnage; the air itself becomes infected with the odor of blood. In the fjord, now stained crimson, there is a confused mass of boats and blood-splashed men wading fearlessly among the floundering whales. Some of these make mad rushes for shore, scattering groups of men bend-

A school of "blackfish" at Cape Cod. These animals often work their way into shallow water, where they are stranded by the receding tide.

ing over the stranded *grind;* others in their last agonies dive on the muddy bottom and, half out of water, beat the air with their great tails. The hunt may last for hours, for some of the boats chase the stragglers even out to the open sea.

When the carnage has ended and the receding tide

A Pacific blackfish (*Globicephalus scammoni*). This species has no white on the under parts.

has left the *grind* high and dry upon the beach, the sheriff and his assistants count and measure the animals preparatory to allotment. Every porpoise has its special number cut into the thick blubber which covers its cylindrical head. The largest whale is given to the native who first sighted the school. One-tenth of the

rest is put aside for the sheriff's fee, taxes, and expenses; of the remainder a large proportion is allotted to the villagers living on the borders of the fjord where the kill takes place, every woman and child having a share. The total value of a catch of five or six hundred may be over $12,000.

The morning following the hunt the cutting in begins, each crew or group of villages taking, without bickering or protestation, the whales apportioned to them by the sheriff. After the blubber has been removed, the meat is carefully cut away from the skeleton, piled in neat heaps, and carried away by the women in wooden creels to their homes. All that remains to mark the scene of carnage is the white skeletons bleaching in the sun.

But blackfish are not of use to the Faroe Islanders alone, for wherever one of the old-time whaling vessels cruises for sperm whales, the green crews and gear are tried out if a school is found. And throughout the voyage when whales are scarce, few of the vessels are above "lowering" for a herd of these huge porpoises.

The common blackfish of the North Atlantic is without a trace of color above, but has a narrow line of white on the breast and belly, which widens into a fountain-jet shape on the throat. The species found on the American Atlantic coast south of New York (*G. brachypterus*) is black everywhere upon its body, like the blackfish of the Pacific (*G. scammoni*). Twenty-four feet seems to be about the maximum size of this porpoise, which in the entire family is exceeded in length only by the killer whale.

CHAPTER XXVI

THE PASSING OF THE WHALE

THE world hunt for the whale began a thousand years ago in the Bay of Biscay and it bids fair to end ere the close of the twentieth century.

After the extermination of the North Atlantic right whale on the coast of Spain, the hunters pushed northward to Finland and Iceland, and it is even possible that whalers visited Newfoundland long before Columbus saw American shores.

The relentless warfare to which the right whale was subjected for hundreds of years culminated in the sixteenth century, and only stopped short of actual extermination through the discovery, in the far north, of its larger and more valuable relative, the bowhead. Then the right whale dropped from sight, supposedly being extinct, and although it appeared again a hundred years later, it has never recovered from the effects of its early persecution.

The capture of the bowhead began in 1612 in the open waters between Spitzbergen and Greenland, and soon extended to Davis Strait and Baffin Bay. After two hundred years of unceasing pursuit this whale was driven to the remotest parts of the Arctic Ocean and was so nearly exterminated that now, when north-

ern whaling has practically ended, its recovery in numbers is exceedingly doubtful.

All this happened before the modern harpoon-gun diverted attention to the fin whales, which during the last half-century have been so ruthlessly butchered by means of every invention at man's disposal that their commercial extinction is inevitable within a very few decades if the slaughter is continued unchecked.

By commercial extinction I mean decrease in the number of whales to the point when their pursuit will no longer be profitable. While this may not mean total extermination because of the great expense connected with the modern methods of capture and handling the carcasses, yet the whales will have been so reduced in numbers that they can never again become abundant. Enormous and highly specialized animals are usually slow breeders and especially liable to extinction, and since it has taken millions of years to evolve the whale, it is extremely unlikely that such evolution can again be duplicated upon this planet.

Even if we deny whales the right to live, and disregard the scientific importance of this marvelously specialized group of mammals, it is apparent that, reduced to a sordid standard, our problem demands immediate attention. It is of the utmost importance that while there is yet time the governments of the world should realize that if proper legislation is enacted to regulate the killing of whales, a great and lucrative industry can not only be conducted profitably in the present, but preserved for the future.

The history of modern whaling in Newfoundland,

where American shore stations were first established, is an excellent example of what will happen sooner or later in every other part of the world if commercial greed remains unchecked. In 1908, Dr. Frederic A. Lucas, who from personal investigation is one of the best informed students of the subject, published a carefully prepared account of the Newfoundland fishery and I cannot do better than quote here a portion of his remarks. Dr. Lucas says:

Before 1903 we have no data as to the number of whales taken along the coast of Newfoundland and can only say that the value of whale products rose successively from $1,581, in 1898, to $36,428, in 1900, and $125,287 in 1902. Making a rough estimate, based on the value of the whale fishery, one may say that this represents not less than 350 whales, more probably about 500, since prior to 1902 the waste was very great. The first whaling station in which modern methods were adopted was established in 1897 and its success was so great that in 1903 four others had been erected and three more planned, although but three steamers were then employed. R. T. McGrath in the Report of the Newfoundland Department of Fisheries for 1903 gave it as his opinion that no more applications for factories should be granted for some years to come, saying, "Two factories are about to be erected, one at Trinity and one at Bonavista —during the coming year. This will make eight factories in all, viz., Balena, Aquaforte, Snook's Arm, Chalem Bay, Cape Broyle, Bonavista and Trinity. In my opinion no further applications should be granted for some years. If licenses are given without restriction, it will result in complete depletion of this industry within a short time; whilst if judiciously dealt with, it will be a profitable source of revenue, and a great assistance to the laboring people of the

colony for many years to come." This advice, however, was not heeded, the only restriction placed on whaling being that stations should not be nearer one another than twenty miles and that but one steamer should be employed. These restrictions were practically of no avail, as one steamer was all that could then be employed to advantage and a run of twenty miles is nothing to a 12-knot vessel. So whaling stations rapidly multiplied until by 1905 eighteen were in operation, occupying all the more favorable locations about Newfoundland, Labrador and the Gulf of St. Lawrence, and fifteen steamers were employed. The effects of this over-multiplication were felt at once, and while in 1903 three steamers took 858 whales, or an average of 286 each, in 1905 fifteen steamers took but 892 whales, or an average of only 59 a vessel.

In 1903	3 vessels took.....	858	whales
" 1904	10 " "	1,257	"
" 1905	15 " "	892	"
" 1906	14 " "	429	"
" 1907	14 " "	481	"
		3,935	whales
Taken between 1898-1902, estimated		350	"
		4,285	whales

Thus in ten years more than 4,000 whales have been captured in the immediate vicinity of Newfoundland. The effect was disastrous and caused the ruin of the smaller companies, the chief sufferers being the smaller shareholders who had invested their entire capital.

Since then the number of stations in operation has been reduced and some of the steamers sold, not more than ten stations being operated in any one year and only six or eight

of these at one time. Still the catch has steadily decreased and in 1913 only two hundred and twenty-two whales were taken.

One of the arguments in favor of indiscriminate whaling has been the theory that whales had the whole world to draw upon and that the depletion in any one locality would soon be supplied by overflow from another. To a slight extent this may be true, for there seems some reason to believe that whales do now and then pass from the Pacific to the Atlantic,[1] but on the whole whales are restricted in their range as other animals [2] and extermination in one place means extermination in that locality for all time. Another fallacy was the belief that the supply of whales was practically limitless and that one might "slay and slay and slay" continuously. There is not a more mischievous term than "inexhaustible supply," and certainly none more untrue. So we see our inexhaustible forests on the verge of disappearing, our inexhaustible supplies of coal and oil daily growing less, and the end of the inexhaustible supply of whales in sight. Man is recklessly spending the capital Nature has been centuries in accumulating and the time will come when his drafts will no longer be honored. It matters not whether the vessel is a bucket or an ocean, one can only take out as much water as it contains and where all is outgo and no income, it is merely a question of time when one or the other will be emptied.[3]

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[1] "Capt. Bull states that a sulphur-bottom whale shot on the coast of Norway contained a harpoon fired into it on the coast of Kamchatka and that a humpback killed off Aquaforte was found to have in the flesh an unexploded bomb lance fired from a San Francisco whaler in the Pacific."

[2] "For example, the sulphur-bottom is not found or occurs as a straggler on the east coast of Newfoundland; although once common on the south coast."

[3] "The Passing of the Whale." Zoölogical Society Bulletin, July, 1908, No. 30, supp., pp. 446-447.

Thus, about fifteen years after the first modern station was erected in Newfoundland shore whaling practically ended, for today only six or eight factories are in operation and have a *combined* yearly catch of about two hundred whales, instead of over one thousand two hundred as in 1904.

With Newfoundland's history in mind we may turn to the American Pacific where, because of different conditions, the story has been only partially duplicated. From Mexico to Bering Sea there is an enormous extent of coast line where the feeding grounds lie close to shore and sustain a proportionally greater number of whales than in the restricted area of Newfoundland and Labrador. Here, as in every other ocean, the result of persistent persecution will be inevitable, but under such conditions it will be longer deferred.

There is a slow but constant yearly decrease in the number of whales taken along the Pacific Coast, and yet if stations are not concentrated, undoubtedly the industry will continue to be a profitable one for several years to come.

Near the islands of the sub-Antarctic, conditions are more favorable for shore whaling than in any other portion of the world. The waters of these seas are especially productive of the shrimp (*Euphausia*) and other plancton upon which most of the large Cetacea feed, and thousands of fin whales are present where there are dozens in other oceans. This great abundance of marine life caused the development of the

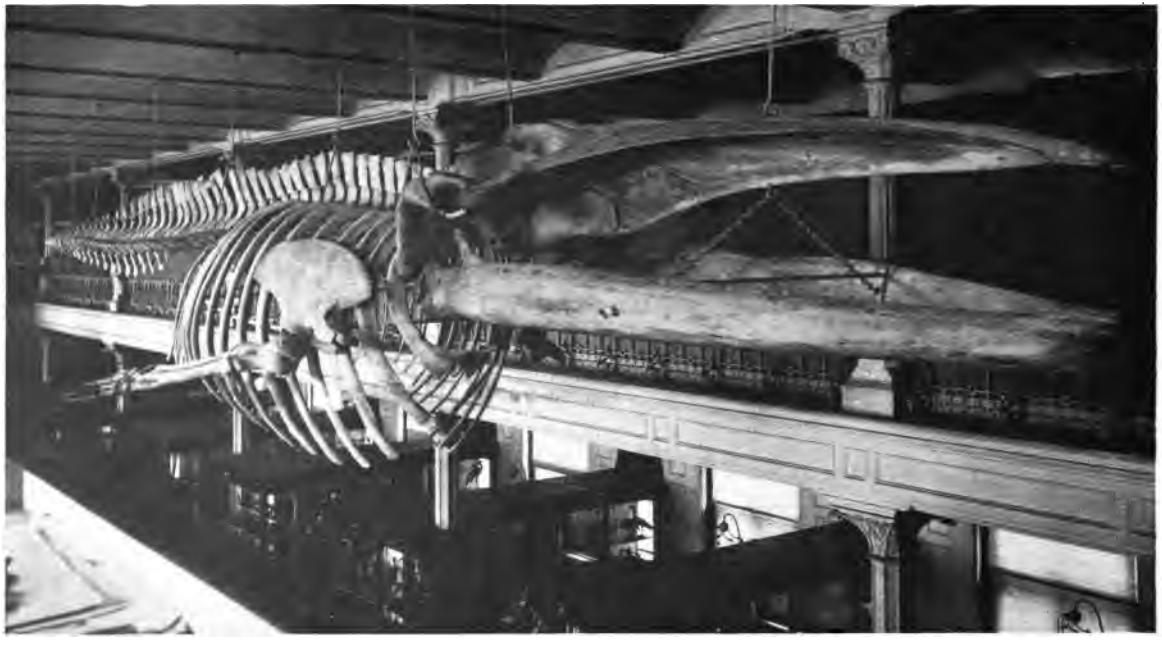
floating factories which until recently operated without restriction and are the most pernicious agencies of modern invention in the wholesale destruction of whales.

A floating factory consists of a large steamer equipped with blubber try works and can be moved about from place to place as the feeding grounds change. Four or five vessels hunt from each floating factory, supplying it with whales from which the blubber is stripped off and tried out on board the large ship.

When operations first began in the sub-Antarctic, whales could be killed so easily that in some instances only the thickest portions of the blubber were taken and the remainder left upon the carcass to be turned adrift; thus but a fractional portion of the value of each whale was secured while thousands of animals were killed. A blue whale eighty feet long, treated in this manner, would probably not be worth more than $40 or $50, while in Japan, where the by-products are highly utilized, a specimen of equal size would have a value of $4,000.

Very fortunately at South Georgia, one of the largest whaling centers of the far southern waters, the British Government realized that such pernicious activities could only result in the quick ruin of the industry, and enacted laws which compelled the floating factories to use the carcasses as well as the blubber.

While to the early hunters on the South Atlantic grounds the supply of whales must have seemed in-



A skeleton of a finback whale in the American Museum of Natural History.

exhaustible, yet the concentrated activity of the last ten years has caused alarming inroads into the great herds which fed along the edge of the Antarctic Circle.

On South Georgia alone there are at the present time eight stations with headquarters in Norway, Great Britain, and Argentina, and the South Shetlands, Falkland, South Orkney, and Kerguelen Islands are the homes of many floating factories and permanent stations.

It is true that because of its remoteness the cost of whaling operations in the far south is very heavy and that the slaughter will cease automatically when the profits are no longer commensurate with the investment, but owing to the extraordinary concentration of whales on these feeding grounds, before that time comes the ravages will have been so great that probably the animals can never again attain a firm hold upon life.

The excessive slaughter in the South Atlantic has a direct effect upon the industry in other parts of the world, for it is very probable that the fin whales go northward from the Antarctic waters into both the Atlantic and Pacific Oceans.

In Japan it will be a national catastrophe when whaling ceases, because the diet of the ordinary native would consist of little besides rice, fish, and vegetables were it not for the thousands of tons of whale meat which are distributed fresh or canned to almost the entire Empire, and which furnish a healthful and palatable food at a low cost.

Since labor is very cheap in Japan and especially because each whale is worth an extraordinary amount for food, operations can be carried on long after they would be unprofitable in almost any other part of the world; thus the extermination of whales will undoubtedly be very nearly complete in the Island Empire.

The flesh of the humpback is most highly esteemed for food by the Japanese and this species was consequently very ardently pursued. Although most abundant of all a few years ago, humpbacks are now so rare that only twenty-five or thirty are taken yearly in all Japan. The blue whales are disappearing almost as rapidly and it will not be long before the Japanese will have to depend entirely upon the finback, gray, and sei whales.

Unfortunately there appears to be a universal belief that shore whaling is a short-lived industry and that everyone must get for himself the greatest possible share of the profits without regard for the future. It is commercial greed in its worst form, because in the mad scramble for quick money, such pernicious operations as those of the floating factory are inaugurated, and but a small part of the real value of each whale is secured after its life has been taken.

My plea is for proper legislation which will force the industry to develop its great untouched possibilities and save it for the future while yielding a reasonable profit during the present.

But it must be *intelligent* legislation, for "blanket" laws are worse than none at all. Conditions vary with every place where shore whaling is conducted and

laws which were excellent for Newfoundland would be absurd on the coast of British Columbia.

Personally I cannot see how the much-discussed international legislation can be of assistance. It appears to me that local laws are what is needed.

Experts should be employed to study carefully conditions in each locality in order that recommendations may be intelligent. I know of one government which actually declared a closed season upon whales, during which the animals could not be hunted, obviously to allow the females to bring forth their young. Since the fin whales breed irregularly throughout the year, such bungling attempts at legislation are worse than useless and serve only to expose the ignorance of those who make them.

In not a single country of the globe where shore whaling is being carried on today are there intelligent laws to insure for the future an industry which is yielding millions of dollars every year, or to save from extermination the animals which, of all others on the land or in the sea, have taken the most important place in the history of the world.

APPENDIX

I. CLASSIFICATION OF THE CETACEA

In order to make clear the relations to each other of the whales and porpoises I have given below a classification and brief diagnosis of the principal groups. The currently accepted subfamilies of the Physeteridæ and Platinistidæ have been omitted for the purpose of simplifying the classification.

Order Cetacea. Whales and Porpoises.

A. Suborder Mystacoceti. Whalebone Whales.

I. Family Balænidæ. Right and Fin Whales.

a. Subfamily Balæninæ. Right Whales. Head long—skull much arched—whalebone long and very fine—no grooves on ventral surface—no dorsal fin—greatest length, 65 feet.

b. Subfamily Balænopterinæ. Fin Whales. Head short — skull slightly arched—whalebone short and coarse—grooves on ventral surface—a dorsal fin—greatest length, 87 feet.

II. Family Neobalænidæ. Pigmy Right Whale. Head short — skull greatly arched—whalebone long, slender and white—no ventral grooves—a dorsal fin—ribs very broad and flat.

III. Family Rhachianectidæ. California Gray Whale. Head short and moderately arched—

whalebone short, coarse and widely spaced—2 to 4 grooves on the throat—no dorsal fin—greatest length, 48 feet.

B. Suborder Odontoceti. Toothed Whales.

I. Family Physeteridæ. Sperm Whales.
Head large and blunt—a single blowhole —40 to 50 teeth in the lower jaw—no functional teeth in upper jaw—a dorsal hump—greatest length, 70 feet.

II. Family Ziphiidæ. The Ziphioid Whales.
Head pointed—snout produced in form of a beak—a single crescent-shaped blowhole on top of head—one or two pairs of functional teeth in lower jaw—no teeth in upper jaw—greatest length, 30 feet.

III. Family Delphinidæ. Porpoises.

a. Subfamily Delphininæ.
Medium size—two or more neck vertebræ joined—single crescent-shaped blowhole on top of head—teeth in both jaws —usually a high dorsal fin—greatest length, 30 feet.

b. Subfamily Delphinapterinæ. White Whale and Narwhal.
Medium size—head small and neck vertebræ all separated—single crescent-shaped blowhole on top of head—no dorsal fin—flippers very broad—greatest length, 20 feet.

IV. Family Platinistidæ. Fresh Water Porpoises.
Small size—neck vertebræ all separate—single crescent-shaped blowhole on top of head—all inhabit fresh or brackish water—greatest length, 12 feet.

APPENDIX

II. DIAGNOSES OF THE WHALES DESCRIBED IN THIS BOOK

BLUE WHALE, SULPHURBOTTOM

Balænoptera musculus (Linn.)

Very large size. Average length, 76 feet; maximum length, 87 feet. The pectoral fins are about 15 per cent. of the total length, falcate and bluntly pointed. The dorsal fin is small and variable in form, but usually more or less falcate; it is situated behind the line of the anus. Many ventral folds.

The color of the body is mottled gray, the proportions of light and dark tints varying greatly in different individuals, but the body is usually lightest at the shoulder and between the flippers and the umbilicus. The head is a little darker than the body and unmarked. A few entirely white spots are usually present on the posterior ends of the abdominal folds.

The pectoral fins are gray on the upper surface, except at the tip, and white below. The flukes are plain gray above, and below are marked with fine light and dark gray lines running antero-posteriorly. The dorsal fin is dark gray and the whalebone black.

The rostrum of the skull is very broad with the free margins of the maxillæ convex; the nasal bones are oblong with truncated anterior margins. Vertebral formula: cervicals 7, dorsals 15 (–16), lumbars 14 (–16), caudals 26 (–28). Total, 63–65. Habitat: cosmopolitan.

FINBACK, RAZORBACK

Balænoptera physalus (Linn.)

Large size and very slender form. Average total length, 62 feet; the maximum, 81 feet. The pectoral fins are about 12 per cent. of the total length, lanceolate and pointed. The

dorsal fin is moderate in height and falcate; it is situated just behind the line of the anus. Many ventral folds.

The color of the body is dark gray above and white below, the two colors merging imperceptibly into each other on the flanks. The coloration of the head is not bilaterally symmetrical, there being more white on the right side than on the left. The right side of the lower jaw is white and also the anterior third of the whalebone; the left side of the lower jaw and left baleen are dark gray. The gray of the flanks extends obliquely down and back from the pectoral fins toward the flanks, but does not reach the inferior edge of the peduncle, which is white.

The pectoral fins are gray above and white below. The flukes are dark gray above and white below, with a gray posterior margin The whalebone is gray, striped longitudinally with yellowish white in varying proportions; the anterior baleen on the right side is all yellowish white.

The rostrum of the skull is narrow and pointed with the free margins of the maxillæ nearly straight. The nasal bones are narrow and pointed on the median line anteriorly. Vertebral formula: cervicals 7, dorsals 15 (–16), lumbars 14 (–15), caudals 25 (–26). Total, 61–63. Habitat: cosmopolitan.

SEI WHALE, RUDOLPHI'S RORQUAL

Balænoptera borealis (Lesson)

Moderate size. Average total length, 42 to 43 feet; maximum length, 53 feet. The dorsal fin is large, and falcate; it is situated just anterior to the line of the anus. Many ventral folds.

The color of the head and back is dark gray; on the sides and flanks the gray of the back becomes lighter and the flanks are beautifully marked with wavy gray lines. The throat and breast are white, but a wide dark gray band runs across the belly. The ventral line from the anus to the flukes is gray. The pectoral fins above and below are dark

gray, but somewhat lighter on the anterior half of the under side. The flukes above are dark gray like the back, and below are light gray in the ventral portion, becoming darker on the edges. The whalebone is bluish-black with white bristles.

The rostrum of the skull is narrow and triangular with straight sides as in the Finback. The nasal bones are oblong and truncated anteriorly. The first rib is usually bifurcated. Vertebral formula: cervicals 7, dorsals 14 (–13), lumbars 13 (–14), caudals 22 (–23). Total, 56–57. Habitat: cosmopolitan.

HUMPBACK

Megaptera nodosa (Bonn.)

Form massive and ungraceful. Head flat and blunt with dermal tubercles along the sides and middle. Ventral folds few and broad. Average total length, 45 feet; maximum length, 55 feet. The pectoral fins are more than one-fourth the entire length with several prominent bunches along the anterior edge. The dorsal fin is low, thick and somewhat falcate, and the flukes are broad with crenate posterior edges.

The color is black with white markings. The head, back and sides are black and the throat and breast to about opposite the pectoral fins are splashed and streaked with white in varying degrees. On the lower lips, sides of the jaw and about the chin, throat and breast are spots, circles and crescents of white; these are probably the scars left by barnacles and other parasites. Between the flippers in the middle of the breast there is usually an irregular transverse patch of white, 10 or 12 inches in diameter.

The flippers are black above with many white spots and circles, and white below except for a broad patch of black at the base. The flukes are normally black above with white spots along the edges; below they are white, spotted and circled with black, except in the basal third, where there

is a large black area. The whalebone is dull black, with brownish black bristles.

Skull very broad with an obtuse rostrum. The nasal bones are rather narrow and pointed anteriorly. Vertebral formula: cervicals 7, dorsals 14, lumbars 11 (–10), caudals 21. Total, 53 (–52). Habitat: cosmopolitan.

NORTH ATLANTIC RIGHT WHALE, BLACK WHALE

Eubalæna glacialis (Bonn.)

Form massive. Head about one-fourth the total length and rostrum much arched, with a protuberance near the anterior end, called the "bonnet." Lower lip very large, and the free margin is more or less sinuous. Pectoral fins very broad and short. No ventral furrows and no dorsal fin. The color is black throughout, with more or less white on the throat and breast in some individuals. Greatest length, 54 feet.

Rostrum of skull very long, narrow and curved. Nasal bones large, broad and oblong. Sternum broad and irregularly triangular. Scapula broader than high. Vertebral formula: cervicals 7, dorsals 14, lumbars 11 (10–12), caudals 23 (–26). Total, 55 (–57). Habitat: in temperate waters in both hemispheres.

BOWHEAD, GREENLAND RIGHT WHALE

Balæna mysticetus (Linn.)

Form massive. Head enormous, exceeding one-third the total length of the whale. Upper jaw greatly arched to accommodate the long whalebone. No "bonnet." Blowholes elevated and followed by a deep concavity over the "neck." No ventral furrows and no dorsal fin. The color is black, with some white about the throat and lower lips. The whalebone is black, long and very elastic; in some individuals it reaches a length of 14 feet. Greatest length, 65 feet.

Rostrum of skull long, narrow and remarkably arched. Vertebral formula: cervicals 7, dorsals 12, lumbars 14, caudals 22. Total, 55. Habitat: Arctic waters only; not found in Antarctic.

CALIFORNIA GRAY WHALE, DEVILFISH

Rhachianectes glaucus (Cope)

Form robust. Upper jaw moderately arched. Two to four furrows on throat. No dorsal fin. The color is black, or very dark slate, thickly marked about the snout, lips, chin and jaws with white flecks and small spots. On the sides, breast and belly are many roughly elliptical, irregular grayish markings and white circular spots which are apparently the scars left by barnacles. The amount of white varies greatly with individuals, but is seldom entirely absent. The pectoral fins and flukes are black on both surfaces, with scattered white spots and circles. Average size, 40 feet; maximum size, 49 feet.

Skull with a broad strip of frontal exposed upon the vertex. Nasals very long and broad. Cervical vertebræ all free. Anterior ribs with tubercles, necks and heads. Vertebral formula: cervicals 7, dorsals 14, lumbars 12, caudals 23. Total, 56. Habitat: North Pacific Ocean only.

SPERM WHALE, CACHALOT

Physeter macrocephalus (Linn.)

Size large and form massive. Head blunt. A single S-shaped blowhole at the end of the snout. Forty to 50 teeth in lower jaw. No functional teeth in upper jaw. A prominent "hump" on the back.

The color is slate gray, with some white about the lower jaw and snout, which is crossed in every direction by long white lines (scars). White or gray patches are usually found about the umbilicus. Greatest length, 70 feet.

The bones of the skull are elevated to form a high crest above and behind the nares. The rostrum is very massive and wide, but gradually tapers to the apex, and is concave. Lower jaw very long and narrow. Atlas free, but all the other cervical vertebræ united into a solid mass. Vertebral formula: cervicals 7, dorsals 11, lumbars 8, caudals 24. Total, 50. Habitat: cosmopolitan, in warm currents.

KILLER WHALE, ORCA, GRAMPUS, THRESHER

Orca orca (Linn.)

Form robust. Head pointed. Heavy pointed conical teeth in both jaws. An extremely high dorsal fin. The color is black, with an elliptical white spot on each side of head. The throat and breast are white and there is a trident-shaped area of white on the belly and flanks. A white or grayish patch is usually present just behind the dorsal fin. The flukes above are black, and below white except for a black band on the posterior margins and tips. Greatest length, 30 feet.

Rostrum about equal in length to the cranial part of the skull, broad and flattened above, rounded in front. Teeth usually twelve in each jaw. Vertebral formula: cervicals 7, dorsals 11–12, lumbars 10, caudals 53. Total, 51–52. Habitat: cosmopolitan.

WHITE WHALE, BELUGA, *MARSOUIN BLANC*

Delphinapterus leucas (Pallas)

Form robust. Head very small and marked off from body by an ill-defined neck. No dorsal fin. Pectoral fins very broad and upturned. The color is pure white in the adult, except for a very narrow band of brownish on the edges of the flukes and flippers. The young are entirely brownish.

Skull rather narrow and elongated. Eight to ten teeth in both jaws—cervical vertebræ all free. Vertebral formula:

cervicals 7, dorsals 11, lumbars 9, caudals 23. Total, 50. Habitat: North Atlantic and North Pacific.

BLACKFISH, PILOT WHALE, CA'ING OR GRINDHVAL

Globicephalus melas (Traill)

Form robust. Head large and very round. Dorsal fin thick and triangular. Pectoral fins very long and narrow.

The color is black throughout, except for a narrow fountain-shaped area of white on the throat, breast and belly. Greatest length, 30 feet.

Skull broad and depressed. Premaxillæ strongly concave in front of nares. Vertebral formula: cervicals 7, dorsals 11, lumbars 12–14, caudals 28–29. Total, 58 or 59. Habitat: North Atlantic Ocean.

BOTTLENOSE PORPOISE

Tursiops truncatus (Mont.)

Head produced in the form of a beak. Strong teeth in both jaws. A well-developed dorsal fin.

The color is dark gray on the head, back and sides, and the throat, breast and belly are white. Average length, 8 feet; greatest length, 12 feet.

Rostrum tapering. Palate not grooved. Symphysis of mandible short. Forty to 50 teeth. Vertebral formula: cervicals 7, dorsals 13, lumbars 17, caudals 27. Total, 64. Habitat: North Atlantic Ocean.

III. THE SKELETON OF THE CETACEA

The skeletons of whales and porpoises are so frequently preserved in museums that, for the benefit of those who wish to understand more fully the Cetacea, a brief general description of the osteology is given below. Unfortunately,

however, it is impossible to present the subject except in semi-technical language.

The bones of the Cetacea are comparatively light and fragile, the hard, shell-like exterior being thin and the interior filled with spongy "cancellous tissue" which is considerably impregnated with oil. In structure they are exactly opposite to those of the Sirenia (the aquatic mammalian order including the sea cows, or manatees, and the dugongs), which have very heavy solid bones of almost flinty hardness. Cetacean bones are easily affected by weather, and if exposed to the sun, rain and wind for a comparatively short time the hard exterior becomes white and chalk-like.

The whale's skeleton is highly modified in adaptation to an aquatic existence and is very distinctive of the cetacean order. In a general view it is seen to be greatly elongated, the skull is pointed, the fore-limbs are short and flat and the hind-limbs are represented by nodules of bone; all these accompany a fish-like body which offers little resistance to its passage through the water.

The skull is perhaps more greatly modified than any other portion of the skeleton, and if a trained anatomist who had not studied the Cetacea were to examine a whale's skull, he would probably be at a loss to identify correctly its parts. The brain case is small and rounded, the eyes are situated far back and the facial portion greatly elongated. The back of the brain case is formed by an extraordinarily developed supra-occipital bone which extends forward and upward to meet the frontal, entirely excluding the parietals from the summit of the skull. The nostrals have rotated backward and upward and are almost vertical instead of horizontal as in other mammals; thus the nasal bones are greatly reduced in size.

The skull of a toothed whale in general appearance is quite unlike that of a whalebone whale; the nasals are very small, and the maxillæ, premaxillæ and frontals meet above the nostrils to form a bony ridge which is sometimes developed into an extraordinary crest. In some cases the crest

overhangs the blowholes and is asymmetrical, the right side being much more strongly developed than the left.

The facial portion, or rostrum, of the right whales is narrow and greatly arched, but in the Balænopteras it is wide and flat; in the toothed whales it may be either wide and concave, as in the Physeteridæ, or narrow and beak-like as in the Ziphiidæ and Delphinidæ.

The neck, or cervical, vertebræ of all the Cetacea are exceedingly thin and plate-like and usually either two or three of the entire series are fused. In large-headed species, such as the right whales, the neck is reduced to a minimum and the cervical vertebræ are all joined in a solid mass to bear the weight of the enormous skull.

The remainder of the spinal column, as in all mammals, is divided into dorsal, lumbar and caudal vertebræ. The first series bear ribs and the last, which are those of the "tail region," may be distinguished by the V-shaped "chevron bones" attached to the lower side of each vertebral body; because of the absence of functional hind limbs no sacrum is present.

The ribs of the whalebone whales differ from those of other mammals because all but the first two or three have lost the capitulum, or head, and articulate by only the tuberculum to the transverse processes of the vertebræ.

In the baleen whales the sternum, or breast bone, is so reduced that it only articulates with the first pair of ribs, the lower ends of those remaining being free. Thus with the weak attachment of the ribs to the vertebræ and no fastening to the sternum, a loose "thoracic box" is formed, which is capable of great lateral movement as the enormous lungs expand and contract.

In the toothed whales conditions are somewhat different. Many of the ribs have the normal attachment by head and tubercle to the vertebræ and are joined by their lower ends to the sternum, which consists of several pieces; thus the thoracic box is much more rigid than in the baleen whales.

The bones of the fore-limbs of ordinary mammals are

present in the cetacean flipper, but they become greatly flattened and overlaid with adipose tissue to form a paddle. In the right whales the five fingers of the mammalian hand are present, but in others one finger has been lost, and the digits are greatly elongated. The scapula, or shoulder blade, is a wide, flat, fan-shaped bone, and the clavicles, or collar-bones, have entirely disappeared. The hind-limbs are rudimentary, when present at all, only being represented by bony nodules, and the pelvis is reduced to two spindle-shaped bones quite unlike that of land mammals.

The skeleton of each group of the Cetacea, although similar in general characters, varies enormously in the details of construction, and to anyone interested in osteology will prove a fascinating subject for investigation.

IV. ADAPTATION AS SHOWN BY THE CETACEA

There are many indisputable evidences that whales once lived upon the land and walked upon four legs like ordinary quadrupeds, yet how remarkably different from any land mammal is their present form!

We see that almost all aquatic creatures have torpedo-shaped bodies, which offer the minimum of resistance to their passage through the water. Thus as the whales gradually changed from a terrestrial to an aquatic life their bodies assumed the elongated form essential for successful existence in a liquid medium.

Accompanying this change of bodily shape was the elimination of all unnecessary structures which offered resistance, and the whale's smooth, soft, hairless skin was one of the results. But the hair of a land mammal acts as a non-conductor, preventing the heat of the blood from being absorbed by the air, and as the whale's body became naked it was necessary to blanket it with some other protective covering; thus the layer of fat or blubber developed between the skin and the flesh. Fish and amphibians do not need a warm

covering because their blood is cold and changes with the temperature of the medium in which they live.

Besides giving warmth to a land mammal, hair acts as a protection for its tender skin; but since a whale lives in the water, where bruises or abrasions are unlikely, such protection is unnecessary. With the loss of hair the sweat and oil glands which are present in the skins of land mammals finally disappeared.

When any creature becomes aquatic it must necessarily develop means for progression through the water, and thus the caudal portion of the whale's body by degrees expanded into the wide, flat, boneless tail, or flukes. But instead of being vertical to the axis of the body like the tail of a fish, the whale's flukes are horizontal, obviously to give the animal greater facility in rising to the surface to breathe.

With the development of the flukes there came a change in the whale's fore-limbs, which were flattened and covered with connective tissue and blubber. The excellent paddles thus formed, while probably of little use in forward motion, assist in rapid turning and act as balancing organs to keep the animal upright in the water. In some species an adipose dorsal fin has also developed as a further balancing aid.

During the development of the flippers and flukes the hind-limbs, which were no longer of use to the whale, became small and weak, sunk into the blubber and finally disappeared altogether, the greatly modified pelvic elements and nodules of bone or cartilage representing the femur alone remaining.

The heads of most cetaceans are long and pointed, acting as a "cut-water," but one of the most remarkable aquatic adaptations is the position of the nostrils, or blow-holes, which open upon the very summit of the head, in either a single or double aperture, instead of at the end of the snout. The cause of this migration of the nostrils is obvious, for in this position the blowholes first appear at the surface and the whale can begin to breathe while the rest of its body is yet under water.

APPENDIX

In all cetaceans the facial portion of the skull is greatly elongated, and especially in the Mystacoceti the mouth is exceedingly large to accommodate the baleen, which hangs in two parallel rows from the upper jaw. Probably no mammalian adaptation for the securing of food is more remarkable than the whale's baleen. It is almost unbelievable that an animal which once had teeth could, as its food changed, replace them by a complicated straining apparatus such as the whalebone. The baleen is an epidermal growth and is in reality merely an exaggeration of the transverse ridges present in the mouths of land mammals.

We know that the Mystacoceti at one time had teeth, for in fœtal whales two sets of minute teeth are present under the skin, corresponding to the "milk" and "permanent" dentition of ordinary mammals, but these disappear before the baleen begins to develop.

Another interesting feeding adaptation is present in the throat of the whale. The nostrils, instead of opening into the back of the mouth, as in land mammals, are directly connected with the lungs by a prolongation of the "wind-pipe" called the epiglottis, which entirely shuts off the whale's breathing passage from the mouth. Thus the animal can swallow its food beneath the surface without danger of strangulation through getting water into its lungs.

When whales lived upon the land external ears were necessary, but as they became completely aquatic such "sound collectors" were not only of no more use but highly undesirable, because, like the useless hind-limbs, they offered additional resistance to the water; therefore the external ears were lost, but their muscles still remain about the minute ear-orifices of the present-day Cetacea.

The internal modifications which the whales underwent as they assumed an aquatic existence are fully as remarkable as the external changes. In the section on osteology it has been explained how, in living cetaceans, the entire skeleton is loosely articulated so that great flexibility and freedom of movement is given to the body, how the neck

is shortened and the vertebræ have become thin and closely packed together to support the large head, and how the breast-bone is reduced and the ribs so loosely articulated to the vertebral column that the huge lungs have full power of expansion. All these are necessary modifications of the mammalian skeleton which have been caused by the change from a terrestrial to an aquatic existence.

The lungs of the Cetacea are unlobulated and of extraordinary size; the diaphragm, the muscular partition which separates the thoracic from the abdominal cavity, is oblique, and the brain greatly convoluted and of a high type; the brain is especially notable for the loss of the olfactory, or smelling portions, which are of no use to an aquatic mammal.

Thus it is apparent in a review of only the most obvious changes what a wonderful example of adaptation to environment is furnished by the Cetacea.

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